



**CONESTOGA-ROVERS  
& ASSOCIATES**

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May 13, 2010

Reference No. 056393

Mr. Michael Berkoff  
Remedial Project Manager  
USEPA - Region V  
77 West Jackson Boulevard (SR - 6J)  
Chicago, Illinois 60604 - 3590

Mr. Sam Chummar  
Remedial Project Manager  
USEPA - Region V  
77 West Jackson Boulevard (SR - 6J)  
Chicago, Illinois 60604 - 3590

Dear Messrs. Berkoff & Chummar:

Re: Quality Assurance Project Plan Revision 03, Addendum 05  
12th Street Landfill Operable Unit No. 4  
Former Plainwell, Inc Mill Property Operable Unit No. 07  
Allied Paper, Inc./Portage Creek/Kalamazoo River Superfund Site  
Allegan and Kalamazoo County

Conestoga-Rovers & Associates (CRA) has prepared this letter, on behalf of the Weyerhaeuser Company (Weyerhaeuser), to request the United States Environmental Protection Agency's (USEPA's) approval of the attached Revision 03, Addendum 05 to the Multi-Area Quality Assurance Project Plan (QAPP) for the work related to the 12th Street Landfill and former Plainwell, Inc. Mill Property. The scope of the QAPP addendum includes the following:

- Updating the QAPP to reflect changes in the CRA project team addressing changes in project personnel.
- The addition of Columbia Analytical Services (CAS) to complete the full suite of analytical parameters for the various media included in the project. In the current version of the QAPP (Revision 03, Addendum 04), CAS is only able to conduct analysis for selected parameters, which the primary laboratory, Weyerhaeuser Analytical Testing Services (WATS), does not have the facilities to complete. The attached addendum would allow CAS to complete all of the analysis required by the project, allowing the project team the flexibility to manage the demand on each laboratory and ensure turn around times on analytical data reporting meet project needs.

The addendum to the QAPP only affects selected worksheets. The amended worksheets affected by this addendum are attached for review by USEPA and include the following:

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Equal  
Employment Opportunity  
Employer

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REGISTERED COMPANY FOR  
**ISO 9001**  
ENGINEERING DESIGN



<i>QAPP Worksheet No.</i>	<i>QAPP Worksheet Title</i>
1	Title and Approval Page
2	Identifying Information
5-4	Project Organizational Chart - Plainwell Mill Phase II RI Work Plan
<i>QAPP Worksheet No.</i>	<i>QAPP Worksheet Title</i>
5-5	Project Organizational Chart - 12th Street Landfill Remedial Action Work Plan
6-4	Communication Pathways - Plainwell Mill Phase II RI Work Plan
6-5	Communication Pathways - 12th Street Landfill Remedial Action Work Plan
7	Personnel Responsibilities and Qualifications
9-6	Project Scoping Session Participants Sheet (May/June 2009)
12-1 to 12-17	Measurement Performance Criteria
14	Summary of Project Tasks
15-1 to 15-3	Reference Limits and Evaluation - WATS
15-4 to 15-7	Reference Limits and Evaluation - CAS
19	Analytical SOP Requirements
20	Field Quality Control Sample Summary
23	Analytical SOP References
24	Analytical Instrument Calibration
25	Analytical Instrument and Equipment Maintenance, Testing, and Inspection
26	Sample Handling System (WATS/CAS)
28-1 to 28-21	QC Samples
30-1 and 30-2	Analytical Services
31-4	Planned Project Assessments Plainwell Mill Phase II RI Work Plan
31-5	Planned Project Assessments 12th Street Landfill RA Work Plan
32-3	Assessment Findings and Corrective Action Responses Plainwell Mill Phase II RI Work Plan
32-4	Assessment Findings and Corrective Action Responses 12th Street Landfill RA Work Plan

In addition to the worksheet amendments, several additional laboratory standard operating procedures (SOP) are being added to the QAPP through this addendum related to analysis to be performed by CAS. These include:



<i>CAS SOP No.</i>	<i>CAS SOP Title</i>
C-1	Volatile Organic Compounds by GC/MS (VOCs-8260)
C-17	Metals and Semi-volatiles SPLP Extraction (EPA Method 1312)
C-18	Determination of Metals and Trace Elements by Inductively Coupled-Mass Spectrometry (ICP-MS) Method 200.8
C-19	Total Cyanides and Cyanides Amendable to Chlorination
<i>CAS SOP No.</i>	<i>CAS SOP Title</i>
C-20	Semi-volatile Organic Compounds by GC/MC (EPA Method 8270C)
C-21	Continuous Liquid - Liquid Extraction
C-22	Gasoline Range Organics by Gas Chromatography
C-23	Analysis of Water, Solids and Soluble Waste Samples from Semi-Volatile Fuel Hydrocarbons
C-24	Automated Soxhlet Extraction
C-25	Ultrasonic Extraction
C-26	Florish® Cleanup
C-27	GEL Permeation Chromatography
C-28	Total Solids (GEN-160.3)
C-29	Metals Digestion (MET-3050)
C-30	Metals Digestion (MET-DIG)
C-31	Determination of Metals and Trace Elements by Inductively Coupled Plasma Atomic Emission Spectrometry (ICP)
C-32	Mercury in Solid or Semisolid Waste
C-33	Mercury in Liquid Waste

As you are aware, the project is moving forward and will be at a stage where the flexibility in laboratory selection is critical in the near future. Therefore, your timely attention to the attached addendum is appreciated.



**CONESTOGA-ROVERS  
& ASSOCIATES**

May 13, 2010

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Reference No. 056393

Should you have any questions on the above, please do not hesitate to contact us.

Yours truly,

CONESTOGA-ROVERS & ASSOCIATES

Gregory A. Carli, P.E.

GAC/cs/1

Encl.

cc: J. Saric (USEPA)  
L. Kirby-Miles (USEPA)  
T. Prendiville (U.S. EPA)  
S. Borries (U.S. EPA)  
R. Frey (U.S. EPA)  
P. Bucholtz (MDNRE)  
K. Zakrzewski (MDNRE)  
E. Wilson (City of Plainwell)  
R. Gay (Weyerhaeuser)  
M. Lebo (Weyerhaeuser)  
J. Jackowski (Weyerhaeuser)  
M. Erickson (Arcadis)  
D. Penniman (Arcadis)  
G. Griffith (Georgia-Pacific LLC)  
J. Keiser (CH2M Hill)  
S. Hutsell (CH2MHill)  
J. Lifka (Tetra Tech)  
J. Quigley (CRA)  
A. Stadnyk (CRA)  
P. Wiseman (CRA)

**QAPP Worksheet #1  
Title and Approval Page**

<b>Site Name/Project Name:</b>	Allied Paper, Inc./Portage Creek/Kalamazoo River Superfund Site
<b>Site Location:</b>	Kalamazoo and Allegan Counties, including (but not limited to) 3 miles of Portage Creek and the Kalamazoo River from the City of Kalamazoo to Lake Michigan <ul style="list-style-type: none"> <li>▪ Operable Unit No. 4 - 12<sup>th</sup> Street Landfill</li> <li>▪ Operable Unit No. 7 - Plainwell Mill</li> </ul>
<b>Document Title:</b>	Multi-Area Quality Assurance Project Plan, Weyerhaeuser Company
<b>Lead Organization:</b>	U.S. EPA Region 5
<b>Preparer's Name and Organizational Affiliation:</b>	Gregory A. Carli, P. E., CRA
<b>Preparer's Contact Information:</b>	2055 Niagara Falls Boulevard, Suite #3, Niagara Falls, New York, 14304 gcarli@croworld.com
<b>Preparation Date:</b> ( <sup>1</sup> ) Revision 03, Addendum No. 5 represents changes in laboratory services provided by Columbia Analytical Services (CAS) to include all active testing and includes changes in CRA project personnel (Project Coordinator and Field QA Officer). Only revised Worksheets are provided..	Revision 00 - June 2007      Revision 01-September 2007 ( <i>i.e.</i> , Addendum) Revision 02 - February 2008      Revision 02, Addendum 2 - September 2008 Revision 02, Addendum 3 - November 2008; Revision 03, Addendum 4 - June 2009; Revision 03, Addendum 5 - May 2010
<b>Investigative Organization's Project Manager For Investigative Activities at the Plainwell Mill (Operable Unit No. 7):</b>	Signature: _____ Gregory Carli, CRA
<b>Investigative Organization's Project Manager For Investigative Activities at the 12<sup>th</sup> Street Landfill (Operable Unit No. 4):</b>	Signature: _____ Gregory Carli, CRA
<b>Investigative Organization's QA Officer:</b>	Signature: _____ Paul Wiseman, CRA
<b>Lead Organization's Program Manager for the 12<sup>th</sup> Street Landfill (Operable Unit No. 4):</b>	Signature: _____ Michael Berkoff, U.S. EPA Region 5
<b>Lead Organization's Program Manager for the Plainwell Mill (Operable Unit No. 7):</b>	Signature: _____ Sam Chummar, U.S. EPA Region 5
<b>Weyerhaeuser Analytical Testing Services (WATS) Laboratory Manager:</b>	Signature: _____ Dennis Catalano, Weyerhaeuser
<b>Columbia Analytical Services, Inc. (CAS) Laboratory Manager:</b>	Signature: _____ Jeff Christian, CAS

**Title:** Multi-Area Quality Assurance Project Plan

**Revision Number:** 03

**Addendum Number:** 05

**Revision Date:** May 2010

**Page 2 of 2**

**QAPP Worksheet #1  
Title and Approval Page**

U.S. EPA Quality Assurance Reviewer:	Signature: _____ U.S. EPA Region 5
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**Document Control Number:** 56394 (3)-001

**QAPP Worksheet #2  
Identifying Information**

<b>Site Name/Project Name:</b>	Allied Paper, Inc./Portage Creek/Kalamazoo River Superfund Site
<b>Site Location:</b>	Kalamazoo and Allegan Counties, including (but not limited to) 3 miles of Portage Creek and the Kalamazoo River from the city of Kalamazoo to Lake Michigan <ul style="list-style-type: none"> <li>▪ Operable Unit No. 4 - 12<sup>th</sup> Street Landfill</li> <li>▪ Operable Unit No. 7 - Plainwell Mill</li> </ul>
<b>Site Number/Code:</b>	MID006007306
<b>Operable Unit:</b>	Operable Units No. 4 and 7
<b>Contractor's Name:</b>	NA
<b>Contractor's Number:</b>	NA
<b>Contract Title:</b>	NA
<b>Work Assignment Number:</b>	NA
<b>Identify guidance used to prepare QAPP:</b>	Uniform Federal Policy for Quality Assurance Project Plans, Manual VI (U.S. EPA, 2005a)
<b>Identify regulatory program:</b>	Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA)
<b>Identify approval entity:</b>	U.S. EPA Region 5
<b>Indicate whether the QAPP is a generic or a project-specific QAPP:</b>	This is a project-specific Multi-Area QAPP for Remedial Action implementation at the 12 <sup>th</sup> Street Landfill (Operable Unit No. 4) and the Remedial Investigation activities at the Plainwell Mill (Operable Unit No. 7). This QAPP will be updated as required for future work at the 12 <sup>th</sup> Street Landfill Site and Plainwell Mill.
<b>List dates of scoping sessions that were held:</b>	Emergency Activities for the 12 <sup>th</sup> Street Landfill: May 8, 2007, and June 6, 2007, at U.S. EPA Region 5 offices in Chicago, Illinois  Emergency Activities for the Plainwell Mill Banks: August 14, 2007, Submittal of conceptual design approach and follow-up discussions regarding U.S. EPA comments  Predesign Investigations for the RD for the 12 <sup>th</sup> Street Landfill: December 7, 2007, at U.S. EPA Region 5 offices in Chicago, Illinois, and on January 9, 2008, via conference call.

**QAPP Worksheet #2  
Identifying Information**

<b>List dates of scoping sessions that were held (Continued):</b>	Work Plan preparation and comment discussion for Phase 2 of Addendum No. 1 and Plainwell Mill RI/FS – Phase I Initial Groundwater Assessment: July 16, 2008, July 22, 2008 via conference call.  Plainwell Mill RI Work Plan preparation and submittal of Phase II RI Work Plan, May 20, 2009 and related follow up discussions on June 17, 2009.  12 <sup>th</sup> Street Landfill Design medications as presented in CRA memorandum to U.S. EPA dated April 23, 2009; Pre-Final Design Report Addendum No. 1 (May 27, 2009) and related conference calls on April 17, 2009 and May 1, 2009.
<b>List dates and titles of QAPP documents written for previous site work, if applicable:</b>	

**QAPP Worksheet #2  
Identifying Information**

<p><b>Quality Assurance Project Plan, organization partners (stakeholders), and connection with lead organization:</b></p>	<p><b>(Site-Wide QAPP)</b> Blasland &amp; Bouck Engineers, P.C. 1993. Quality Assurance Project Plan, June 1993. Prepared on behalf of the Kalamazoo River Study Group (KRSRG). Approved by the U.S. EPA Region 5 and the Michigan Department of Natural Resources (MDNR). Other stakeholders included the Michigan Department of Environmental Quality (MDEQ), the United States Fish &amp; Wildlife Service, and the National Oceanic &amp; Atmospheric Administration.</p> <p><b>(Operable Unit No. 7)</b> RMT, 2006. Draft Quality Assurance Project Plan for the Remedial Investigation/Feasibility Study – Plainwell Mill, September 2006. Prepared on behalf of Weyerhaeuser Company. Project stakeholders include the MDEQ and the City of Plainwell.</p> <p><b>(Site-Wide QAPP)</b> RMT, Rev. 02, Addendum 3, 2008. This Multi-Area QAPP prepared on behalf of Weyerhaeuser and its representatives within the Allied Paper, Inc./Portage Creek/Kalamazoo River Superfund Site. Stakeholders include the U.S. EPA and the Michigan Department of Environmental Quality (MDEQ) with response pending.</p> <p><b>(Site-Wide QAPP)</b> CRA, Rev. 03, Addendum 4, 2009. This Multi-Area QAPP prepared on behalf of Weyerhaeuser and its representatives within the Allied Paper, Inc./Portage Creek/Kalamazoo River Superfund Site. This document addresses activities associated with the Phase II RI Work Plan at the Plainwell Mill and the removal activities associated with the Remedial Action (RA) at the 12<sup>th</sup> Street Landfill. Project stakeholders include the U.S. EPA and the Michigan Department of Environmental Quality (MDEQ) with response pending</p> <p><b>(Site-Wide QAPP)</b> CRA, Rev. 03, Addendum 5, 2010 (current Addendum). This Multi-Area QAPP prepared on behalf of Weyerhaeuser and its representatives within the Allied Paper, Inc./Portage Creek/Kalamazoo River Superfund Site. This document addresses activities associated with the Phase II RI Work Plan at the Plainwell Mill and the removal activities associated with the Remedial Action (RA) at the 12<sup>th</sup> Street Landfill. Project stakeholders include the U.S. EPA and the Michigan Department of Natural Resources and Environment (MDNRE) with response pending.</p>
<p><b>List data users:</b></p>	<p>Weyerhaeuser Company, U.S. EPA Region 5</p>
<p><b>Lead Organization’s Program Manager:</b></p>	<p><b>Operable Unit No. 4:</b> Michael Berkoff, U.S. EPA Region 5 Remedial Project Manager (RPM)</p> <p><b>Operable Unit No. 7:</b> Sam Chummar, U.S. EPA Region 5 RPM</p>

REQUIRED QAPP ELEMENT(S) AND CORRESPONDING QAPP SECTION(S) (U.S. EPA, 2005a)	REQUIRED INFORMATION	CROSSWALK TO RELATED INFORMATION AND DOCUMENTS
<b>Project Management and Objectives</b>		
2.1 Title and Approval Page	<ul style="list-style-type: none"> <li>▪ Title and Approval Page</li> </ul>	Worksheet #1, Title and Approval Page
2.2 Document Format and Table of Contents	<ul style="list-style-type: none"> <li>▪ Table of Contents</li> </ul>	The Table of Contents is provided following the QAPP cover page.
2.2.1 Document Control Format	<ul style="list-style-type: none"> <li>▪ QAPP Identifying Information</li> </ul>	Worksheet #2, Identifying Information
2.2.2 Document Control Numbering System		
2.2.3 Table of Contents		
2.2.4 QAPP Identifying Information		
2.3 Distribution List and Project Personnel Sign-Off Sheet	<ul style="list-style-type: none"> <li>▪ Distribution List</li> </ul>	Worksheet #3, Distribution List; and
2.3.1 Distribution List	<ul style="list-style-type: none"> <li>▪ Project Personnel Sign-Off Sheet</li> </ul>	Worksheets #4-2 and #4-3, Project Personnel Sign-Off Sheet
2.3.2 Project Personnel Sign-Off Sheet		
2.4 Project Organization	<ul style="list-style-type: none"> <li>▪ Project Organizational Chart</li> </ul>	Worksheets #5-4 and 5-5, Project Organization Charts; Worksheet #6-4 and 6-5,
2.4.1 Project Organization Chart	<ul style="list-style-type: none"> <li>▪ Communication Pathways</li> </ul>	Communication Pathways; Worksheet #7,
2.4.2 Communication Pathways	<ul style="list-style-type: none"> <li>▪ Personnel Responsibilities and Qualifications Table</li> </ul>	Personnel Responsibilities and Qualifications; and Worksheet #8, Special Personnel Training Requirements
2.4.3 Personnel Responsibilities and Qualifications	<ul style="list-style-type: none"> <li>▪ Special Personnel Training Requirements Table</li> </ul>	
2.4.4 Special Training Requirements and Certification		

**QAPP Worksheet #2  
Identifying Information**

<b>Project Management and Objectives (Continued)</b>		
2.5 Project Planning/Problem Definition	<ul style="list-style-type: none"> <li>▪ Project Planning Session</li> <li>▪ Documentation (including Data Needs tables)</li> <li>▪ Project Scoping Session Participants Sheet</li> <li>▪ Problem Definition, Site History, and Background</li> <li>▪ Site Maps (historical and current)</li> </ul>	<p>Worksheet #8, Special Personnel Training Requirements; Worksheets #9-6 and 9-7, Project Scoping Session Participants Sheet; and Worksheets #10-5 and 10-6, Problem Definition-DQOs</p> <p>Site history and more detail concerning the project DQOs can be found in the companion documents to this Multi-Area QAPP.</p> <p>Site maps can be found on Figures 1-1, 1-2, and 2-1 through 2-3.</p>
2.5.1 Project Planning (Scoping)		
2.5.2 Problem Definition, Site History, and Background		
2.6 Project Quality Objectives and measurement Performance Criteria	<ul style="list-style-type: none"> <li>▪ Site-Specific Project Quality Objectives (PQOs)</li> <li>▪ Measurement Performance Criteria Table</li> </ul>	<p>Worksheets # 11-5 and 11-6, Project Quality Objectives/Systematic Planning Process Statements. Worksheets #12-1 through 12-17, Measurement Performance Criteria</p>
2.6.1 Development of Project Quality Objectives Using the Systematic Planning Process		
2.6.2 Measurement performance Criteria		
2.7 Secondary Data Evaluation	<ul style="list-style-type: none"> <li>▪ Sources of Secondary Data and Information</li> <li>▪ Secondary Data Criteria and Limitations Table</li> </ul>	<p>Worksheets #13-1 and 13-2, Secondary Data Criteria and Limitations</p>
2.8 Project Overview and Schedule	<ul style="list-style-type: none"> <li>▪ Summary of Project Tasks</li> <li>▪ Reference Limits and Evaluation Table</li> <li>▪ Project Schedule/Timeline Table</li> </ul>	<p>Worksheet #14, Summary of Project Tasks; Worksheets #15-1 through 15-4, Reference Limits and Evaluation; and Worksheet #16-5 and 16-6, Project Schedules/Timelines.</p>
2.8.1 Project Overview		
2.8.2 Project Schedule		

**QAPP Worksheet #2  
Identifying Information**

<b>Measurement/Data Acquisition</b>		
3.1 Sampling Tasks	<ul style="list-style-type: none"> <li>▪ Sampling Design and Rationale</li> <li>▪ Sample Location Map</li> <li>▪ Sampling Locations and Methods/ SOP Requirements Table</li> <li>▪ Analytical Methods/SOP Requirements Table</li> <li>▪ Field Quality Control Sample Summary Table</li> <li>▪ Sampling SOPs</li> <li>▪ Project Sampling SOP References Table</li> <li>▪ Field Equipment Calibration, Maintenance, Testing, and Inspection Table</li> </ul>	<p>Worksheet #17-5 and 17-6, Sampling Design and Rationale; Worksheet #18-4 and 18-5, Sampling Locations and Methods/SOP Requirements; Worksheet #19, Analytical SOP Requirements (sample containers, preservation, and holding times); Worksheet #20, Field Quality Control Sample Summary Worksheet #21, Project Sampling SOP Reference; and Worksheet #22, Field Equipment Calibration, Maintenance, Testing, and Inspection</p> <p>The laboratory SOPs can be found in Attachment 1-5.</p> <p>More details concerning the sampling design and rationale and the field sampling procedures can be found in the companion documents to this Multi-Area QAPP.</p>
3.1.1 Sampling Process Design and Rationale		
3.1.2 Sampling Procedures and Requirements		
3.1.2.1 Sampling Collection Procedures		
3.1.2.2 Sample Containers, Volume, and Preservation		
3.1.2.3 Equipment/Sample Container Cleaning and Decontamination Procedures		
3.1.2.4 Field Equipment Calibration, Maintenance, Testing, and Inspection Procedures		
3.1.2.5 Supply Inspection and Acceptance Procedures	<ul style="list-style-type: none"> <li>▪ Analytical SOPs</li> <li>▪ Analytical SOP References Table</li> <li>▪ Analytical Instrument Calibration Table</li> <li>▪ Analytical Instrument and Equipment Maintenance, Testing, and Inspection Table</li> </ul>	<p>Worksheet #23, Analytical SOP References; Worksheet #24, Analytical Instrument Calibration; and Worksheet #25, Analytical Instrument and Equipment Maintenance, Testing, and Inspection</p> <p>The laboratory SOPs can be found in Attachment 1-5.</p>
3.1.2.6 Field Documentation Procedures		
3.2 Analytical Tasks		
3.2.1 Analytical SOPs		
3.2.2 Analytical Instrument Calibration Procedures		
3.2.3 Analytical Instrument and Equipment Maintenance, Testing, and Inspection Procedures		
3.2.4 Analytical Supply Inspection and Acceptance Procedures		
3.3 Sample Collection Documentation, Handling, Tracking, and Custody Procedures		
3.3.1 Sample Collection Documentation		
3.3.2 Sample Handling and Tracking System		
3.3.3 Sample Custody		

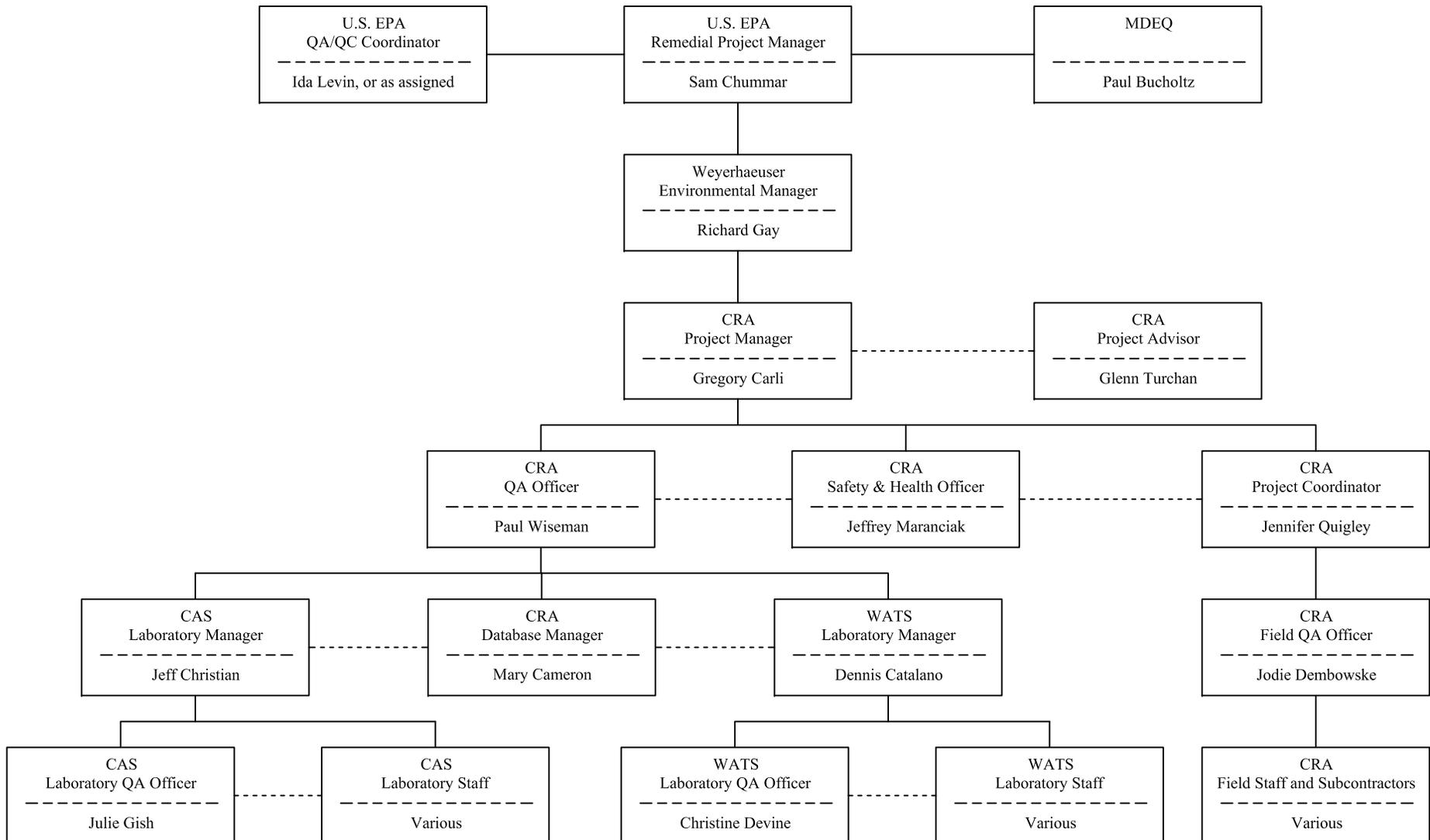
**QAPP Worksheet #2  
Identifying Information**

<b>Measurement/Data Acquisition (continued)</b>		
3.4 Quality Control Samples	<ul style="list-style-type: none"> <li>▪ QC Samples Table</li> <li>▪ Screening/Confirmatory Analysis Decision Tree</li> </ul>	Worksheet #28-1 through #28-21, Present QC sample information for project analysis
3.4.1 Sampling Quality Control Samples		
3.4.2 Analytical Quality Control Samples		
3.5 Data Management Tasks	<ul style="list-style-type: none"> <li>▪ Project Documents and Records Table</li> <li>▪ Analytical Services Table</li> <li>▪ Data Management SOPs</li> </ul>	Worksheet #29, Project Documents and Records, and Worksheet #30, Analytical Services
3.5.1 Project Documentation and Records		
3.5.2 Data Package Deliverables		
3.5.3 Data Reporting Formats		
3.5.4 Data Handling and Management		
3.5.5 Data Tracking and Control		
4.1 Assessments and Response Actions	<ul style="list-style-type: none"> <li>▪ Assessments and Response Actions</li> <li>▪ Planned Project Assessments Table</li> <li>▪ Audit Checklists</li> <li>▪ Assessment Findings and Corrective Action Responses Table</li> </ul>	Worksheet #31, Planned Project Assessments, and Worksheet #32, Assessment Findings and Corrective Action Responses  The laboratory Quality Assurance Manual and Laboratory Policies and Guidelines documents can be found in Attachments 1-4 and 1-6, respectively.
4.1.1 Planned Assessments		
4.1.2 Assessment Findings and Corrective Action Responses		
4.2 QA Management Reports	<ul style="list-style-type: none"> <li>▪ QA Management Reports Table</li> </ul>	Worksheet #33, QA Management Reports
4.3 Final Project Report		

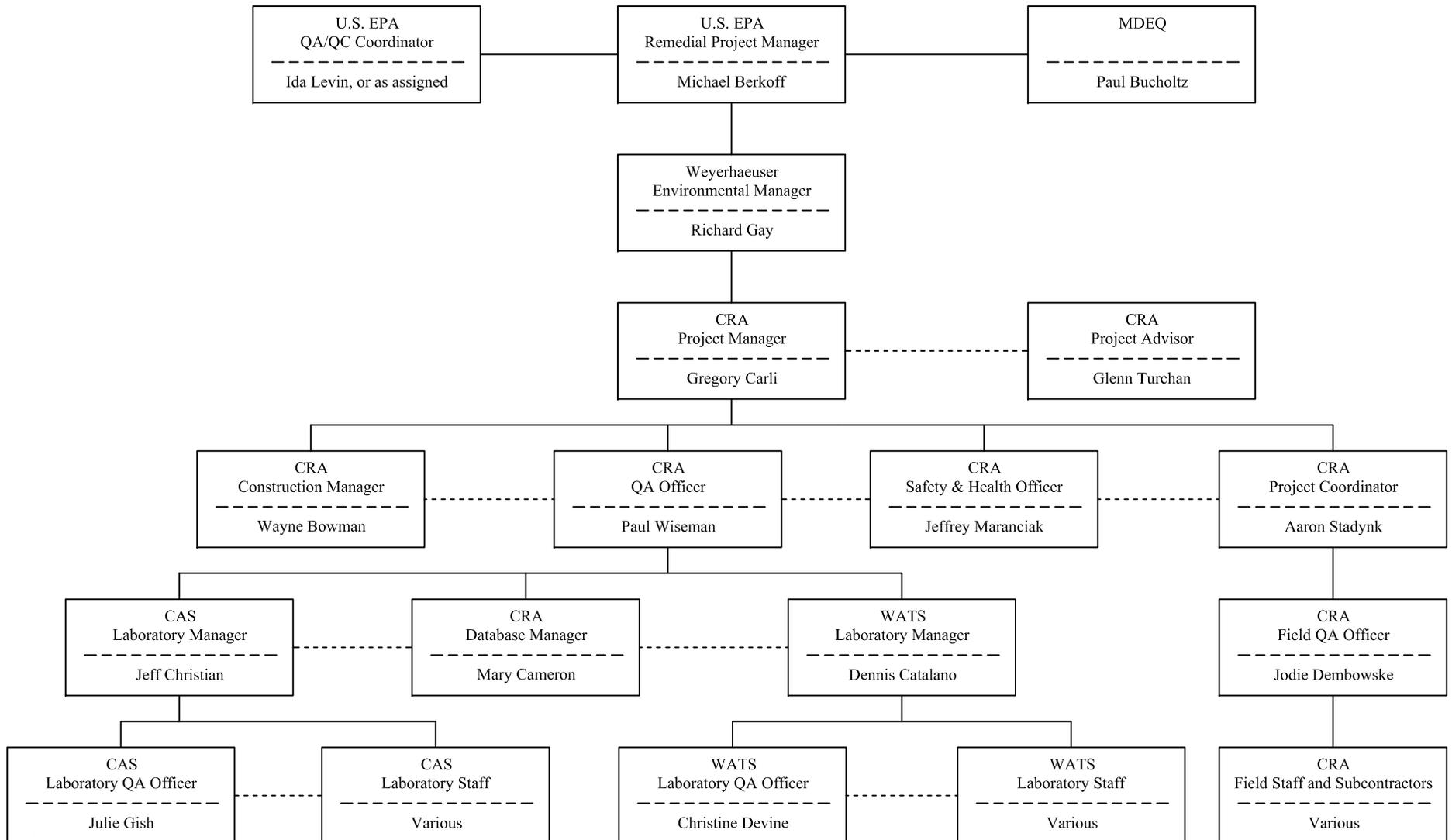
**QAPP Worksheet #2  
Identifying Information**

<b>Data Review</b>		
5.1 Overview		
5.2 Data Review Steps	<ul style="list-style-type: none"> <li>▪ Verification (Step I) Process Table</li> <li>▪ Validation (Steps IIa and IIb) Process Table</li> <li>▪ Validation (Steps IIa and IIb) Summary Table</li> <li>▪ Usability Assessment</li> </ul>	Worksheet #34, Verification (Step 1) Process; Worksheet #35, Validation (Step I) Process; Worksheet #36, Validation (Steps IIa and IIb) Summary; and Worksheet #37, Usability Assessment.
5.2.1 Step I: Verification		
5.2.2 Step II: Validation		
5.2.2.1 Step IIa Validation Activities		
5.2.2.2 Step IIb Validation Activities		
5.2.3 Step III: Usability Assessment		
5.2.3.1 Data Limitations and Actions from Usability Assessment		
5.2.3.2 Activities		
5.3 Streamlining Data Review	<ul style="list-style-type: none"> <li>▪ None</li> </ul>	NA
5.3.1 Data Review Steps To Be Streamlined		
5.3.2 Criteria for Streamlining Data Review		
5.3.3 Amounts and Types of Data Appropriate for Streamlining		

**QAPP Worksheet # 5-4**  
**Project Organizational Chart**  
**Plainwell Mill Phase II RI Work Plan**



**QAPP Worksheet # 5-5**  
**Project Organizational Chart**  
**12th Street Landfill Remedial Action Work Plan**



**QAPP Worksheet #6-4  
Communication Pathways  
Plainwell Mill Phase II RI Work Plan**

COMMUNICATION DRIVERS	RESPONSIBLE ENTITY	NAME	TELEPHONE NUMBER	PROCEDURE (timing, pathways, etc.)
<i>Phase II RI Work Plan- Former Plainwell, Inc Mill Property</i>				
Serve as Point-of-Contact with U.S. EPA Remedial Project Manager (RPM)	Environmental Manager	Richard Gay Weyerhaeuser	501.624.8554	Richard Gay will provide project submittals to Sam Chummar, U.S. EPA, in accordance with the schedule provided on Worksheet No. 16 of this QAPP.
Manage all project phases	Project Manager	Gregory Carli, CRA	716.297.6150	Gregory Carli will be the CRA liaison to the U.S. EPA for activities at the Plainwell Mill and 12 <sup>th</sup> Street Landfill properties.
Coordination of project activities under supervision of Gregory Carli	Project Coordinator	Jennifer Quigley, CRA	517.316.2397	Jennifer Quigley will provide Gregory Carli with an update of project activities including data review and display, data evaluation and analysis, sampling plan preparation and supervision of implementation field sampling activities. Jennifer Quigley will report any QA/QC problems related to field measurements to the QA Officer (Paul Wiseman) by telephone or e-mail by the end of the same business day.
Provide assistance with Site Specific Health and Safety	Safety & Health Officer	Jeffrey Maranciak, CRA	412.449.0812	Jeffrey Maranciak will provide assistance to Project Coordinator and Field QA Officer (Jodie Dembowske) with Site Specific Health and Safety Orientation to all CRA staff. Jeffrey Maranciak will provide Gregory Carli with any problems related to filed health and safety concerns.

**QAPP Worksheet #6-4  
Communication Pathways  
Plainwell Mill Phase II RI Work Plan**

COMMUNICATION DRIVERS	RESPONSIBLE ENTITY	NAME	TELEPHONE NUMBER	PROCEDURE (timing, pathways, etc.)
Notify Gregory Carli, Jennifer Quigley, and the QA Officer of any QAPP changes in the field	Field QA Officer	Jodie Dembowski, CRA	269.344.1230	Jodie Dembowski will provide Gregory Carli and Jennifer Quigley with daily progress report on implementation of field activities and any changes to the QAPP made in the field by e-mail or fax within 2 business days. Jodie Dembowski will also provide Gregory Carli and Jennifer Quigley with any QA/QC problems related to field measurements by telephone or e-mail by the end of the same business day.
Reporting lab data quality issues	Laboratory Manager	Dennis Catalano, WATS	253.924.6242	Dennis Catalano will notify the QA officer (Paul Wiseman) with any QA/QC issues within 2 business days.
Reporting lab data quality issues	Laboratory Manager	Jeff Christian, CAS	360.557.7222	Jeff Christian will notify the QA officer (Paul Wiseman) with any QA/QC issues within 2 business days.
Field and analytical corrective actions	QA Officer	Paul Wiseman, CRA	734.453.5123	Paul Wiseman will determine the need for corrective action for field and analytical issues, in conjunction with the Gregory Carli and Jennifer Quigley, or the Laboratory Manager, as appropriate.
Release of final analytical data	QA Officer	Paul Wiseman, CRA	734.453.5123	No final analytical data can be released until validation is complete and Paul Wiseman has approved the release.
QAPP amendments	QA Officer	Paul Wiseman, CRA	734.453.5123	Any major changes to the QAPP must be approved by Paul Wiseman, Gregory Carli, and the U.S. EPA before the changes can be implemented
Establish and maintenance of project database	Database Manager	Mary Cameron	734.453.5123	Mary Cameron will provide analytical data to Paul Wiseman.

**QAPP Worksheet #6-5  
Communication Pathways  
12<sup>th</sup> Street Landfill Remedial Action Work Plan**

COMMUNICATION DRIVERS	RESPONSIBLE ENTITY	NAME	TELEPHONE NUMBER	PROCEDURE (timing, pathways, etc.)
<b>Remedial Action (RA) – 12<sup>th</sup> Street Landfill</b>				
Serve as Point-of-Contact with U.S. EPA Remedial Project Manager (RPM)	Environmental Manager	Richard Gay Weyerhaeuser Company	501.624.8554	Richard Gay will provide project submittals to Michael Berkoff, U.S. EPA, in accordance with the schedule provided on Worksheet No. 16 of this QAPP.
Manage all project phases	Project Manager	Gregory Carli, CRA	716.297.6150	Gregory Carli will be the CRA liaison to the U.S. EPA for activities at the Plainwell Mill and 12 <sup>th</sup> Street Landfill properties.
Coordination of project activities under supervision of Gregory Carli	Project Coordinator	Aaron Stadnyke, CRA	519.884.0510	Aaron Stadnyke will provide Gregory Carli with an update of project activities including data review and display, data evaluation and analysis, sampling plan preparation and supervision of implementation field sampling activities. Aaron Stadnyke will report any QA/QC problems related to field measurements to the QA Officer (Paul Wiseman) by telephone or e-mail by the end of the same business day.
Provide assistance with construction and redevelopment	Construction Manager	Wayne Bauman, CRA	269.344.1230	Wayne Bauman will provide Gregory Carli with an update of construction activities, including related questions or problems, by telephone or e-mail at the end of each business day.
Provide assistance with Site Specific Health and Safety	Safety & Health Officer	Jeffrey Maranciak, CRA	412.449.0812	Jeffrey Maranciak will provide assistance to Project Coordinator and Field QA Officer (Jodie Dembowske) with Site Specific Health and Safety Orientation to all CRA staff. Jeffrey Maranciak will provide Gregory Carli with any problems related to filed health and safety concerns.

**QAPP Worksheet #6-5  
Communication Pathways  
12<sup>th</sup> Street Landfill Remedial Action Work Plan**

COMMUNICATION DRIVERS	RESPONSIBLE ENTITY	NAME	TELEPHONE NUMBER	PROCEDURE (timing, pathways, etc.)
Notify Gregory Carli, Jodie Dembowski, and the QA Officer of any QAPP changes in the field	Field QA Officer	Jodie Dembowski, CRA	269.344.1230	Jodie Dembowski will provide Gregory Carli and Jodie Dembowski with daily progress report on implementation of field activities and any changes to the QAPP made in the field by e-mail or fax within 2 business days. Jodie Dembowski will also provide Gregory Carli and Jodie Dembowski with any QA/QC problems related to field measurements by telephone or e-mail by the end of the same business day.
Reporting lab data quality issues	Laboratory Manager	Dennis Catalano, WATS	253.924.6242	Dennis Catalano will notify the QA Officer (Paul Wiseman) with any QA/QC issues within 2 business days.
Reporting lab data quality issues	Laboratory Manager	Jeff Christian, CAS	360.557.7222	Jeff Christian will notify the QA Officer (Paul Wiseman) with any QA/QC issues within 2 business days.
Field and analytical corrective actions	QA Officer	Paul Wiseman, CRA	734.453.5123	Paul Wiseman will determine the need for corrective action for field and analytical issues, in conjunction with the Gregory Carli and Jodie Dembowski, or the Laboratory Manager, as appropriate.
Release of final analytical data	QA Officer	Paul Wiseman, CRA	734.453.5123	No final analytical data can be released until validation is complete and Paul Wiseman has approved the release.
QAPP amendments	QA Officer	Paul Wiseman, CRA	734.453.5123	Any major changes to the QAPP must be approved by Paul Wiseman, Gregory Carli, and the U.S. EPA before the changes can be implemented
Development and maintenance of database	Database Manager	Mary Cameron	734.453.5123	Mary Cameron will provide analytical data to Paul Wiseman.

**QAPP Worksheet #7  
Personnel Responsibilities and Qualifications**

NAME	PROJECT ROLE	ORGANIZATIONAL AFFILIATION	EDUCATION AND EXPERIENCE QUALIFICATIONS
Michael Berkoff Sam Chummar	Remedial Project Manager - 12th Street Landfill Remedial Project Manager - Plainwell Mill	U.S. EPA, Region 5	Designated as the U.S. EPA's Project Coordinators
Richard Gay	Environmental Manager	Weyerhaeuser	Designated as the Weyerhaeuser Project Manager
Gregory Carli, P. E.	Project Manager	CRA	B.A.Sc. Civil Engineering, Water Resources Option, University of Waterloo, 1996 Over 13 years of experience
Glenn Turchan, P. E.	Project Director	CRA	B.A.Sc. Geological Engineering, University of Waterloo M.A.Sc. Civil Engineering, University of Waterloo Over 24 years of experience
Jennifer Quigley	Project Coordinator Plainwell Mill	CRA	B.Sc. Environmental Engineering, Michigan Technological University, 1997 Over 12 years of experience
Aaron Stadnyk	Project Coordinator 12th Street Landfill	CRA	B.A.Sc. Environmental Engineering (Chemical Specialization), University of Waterloo, 2006 Over 4 years experience
Paul Wiseman	QA Officer	CRA	B.Sc. Chemistry and Biology, Northern Michigan University, 1980 Over 29 years experience
Wayne Bauman	Construction Manager - 12th Street Landfill	CRA	B.A.Sc. Industrial Engineering, Minor Mathematics, Western Michigan University, 1986 Over 23 years experience
Jeffrey Maranciak	Safety & Health Officer	CRA	B.S. Safety & Environmental Management, Slippery Rock University, 1997 Over 12 years experience
Dennis Catalano	Laboratory Manager	WATS	B.S. Biology with chemistry minor, University of Dayton, 1977 30 years of experience

**QAPP Worksheet #7  
Personnel Responsibilities and Qualifications**

NAME	PROJECT ROLE	ORGANIZATIONAL AFFILIATION	EDUCATION AND EXPERIENCE QUALIFICATIONS
Christine Devine	Laboratory QA/QC Officer	WATS	B..Sc. Mathematics, University of Washington 1998 M.A.Sc. Analytical Chemistry, Illinois Institute of Technology, 2007 Over 10 years of experience
Jeff Christian	Laboratory Manager	CAS	B.S. Chemistry, Evergreen State College, 1993 Over 30 years of experience
Julie Gish	Laboratory QA/QC Officer	CAS	B..Sc. Food Science, Utah State University, 1975 M.A.Sc. Food Science, Oregon State University, 1978 Over 30 years of experience
Jodie Dembowske	Field QA Officer	CRA	M.Sc. Hydrogeology, Western Michigan University, 1994 B.Sc. Geology, Western Michigan University, 1991 Over 16 years experience
Mary Cameron	Database Manager	CRA	B.Sc. Microbiology, University of Michigan, 1984 Assoc. Computer Information Systems, Henry Ford Community College, Dearborn, Michigan, 2001 Over 18 years of experience

**U. S. EPA**

**Remedial Project Manager**

- Serve as the primary point-of-contact for the U.S. EPA.
- Review and approve project submittals.
- Coordinate with the Michigan DEQ and other regulatory agencies as needed.
- Monitor project activities.

**QA/QC Coordinator**

- Review and approve the QAPP.
- Review and approve relevant portions of submitted documents to ensure compliance with the QAPP.
- Coordinate audits, as necessary.

## **WEYERHAEUSER COMPANY**

### **Environmental Manager**

- Serve as the primary point-of-contact between Weyerhaeuser Company and the U.S. EPA.
- Coordinate communications between Weyerhaeuser, CRA, the U.S. EPA, and other parties.
- Review draft project deliverables prior to their submittal to the U.S. EPA.

### **CRA**

#### **Project Manager**

- Serve as the primary point-of-contact for CRA.
- Communicate with Weyerhaeuser Company, the U.S. EPA, and other project stakeholders.
- Establish and communicate project milestones and schedules.
- Coordinate and review CRA work products.
- Direct CRA team members.
- Provide technical input during the planning, design, and implementation stages of the project.
- Review the technical aspects of CRA's submittals.
- Approval of Quality Assurance Project Plan (QAPP).
- Preparation & Review of QAPP

#### **Project Director**

- Provide overall quality assurance, including a review of CRA's performance on the project.
- Review project progress and CRA work products for compliance with project objectives and requirements.
- Provide input regarding Superfund procedures and compliance with the National Contingency Plan (NCP).

#### **Project Coordinator**

- Review existing data, project objectives, and regulatory guidance to assist in the development of project sampling protocols.
- Review and summarize the results of data collected during project implementation, and make preliminary recommendations to the CRA Project Manager regarding the results (*e.g.*, whether additional data collection or field modifications appear to be necessary).

### **Field QA Officer**

- Coordinate environmental staff who will be measuring and recording field parameters, collecting samples, and documenting construction activities, to ensure compliance with this QAPP.
- Order sample bottles from the laboratory.
- Prepare reports pertaining to relevant field activities.
- Maintain field and laboratory files, including project documentation, sample logs, and calculations; and provide complete copies to the CRA Project Coordinator.
- Conduct field audits, as necessary.

### **Safety Health Officer**

- Provide assistance to the Field QA Officer and on-Site staff with Site specific Health and Safety Orientation to all CRA staff and subcontractors, and monitoring site activities for compliance with the project Health and Safety Plan.

### **Construction Manager**

- Coordinate and direct subcontractors and CRA personnel who are performing construction work (*e.g.*, site preparation, excavation).
- Assist Field QA Officer with Health and Safety Orientations for construction-related activities.
- Maintain field records related to construction activities, and provide complete copies to the CRA Project Manager.

### **QA Officer**

- Serve as the primary point-of-contact with the laboratory.
- Coordinate field QA/QC procedures with the Project Coordinator (*e.g.*, calibrations for field analytical measurements, and field audits, as necessary), and review pertinent field records for compliance with this QAPP.
- Review laboratory QA/QC procedures and documentation, as provided in data deliverables.
- Review data for compliance with the Data Quality Objectives (DQOs) for the project.
- Coordinate data validation activities and QA/QC reports preparation.

### **Database Manager**

- Establish and maintain a project database.
- Import electronic data deliverables (EDDs) provided by the laboratory into the project database.
- Perform a QA/QC check of imported data versus the hard copy data.
- Transcribe field and non-EDD laboratory data into the project database, as necessary.

- Tabulate data for end users.

## **ANALYTICAL LABORATORY**

### **Laboratory Manager**

- Serve as the primary point-of-contact for the laboratory.
- Oversee preparation of analytical reports.
- Supervise in-house chain-of-custody.

### **Laboratory QA/QC Officer**

- Maintains laboratory quality assurance procedures
- Maintains laboratory QA/QC documentation
- Verify that the laboratory meets the QA/QC standards specified in this QAPP.
- Perform laboratory audits, in accordance with this QAPP.

**QAPP Worksheet #9-6  
Project Scoping Session Participants Sheet (May/June 2009)**

**Project Name:** Former Plainwell, Inc Mill Property

**Projected Date(s) of Sampling:** 2009 **Site Name:** Allied Paper, Inc./Portage Creek/Kalamazoo River Superfund Site

**CRA Project Managers:** Gregory Carli **Location of Scoping Session:** Conference Call

**Date of Sessions:** May 20, 2009 Phase II RI Work Plan and June 17, 2009 Conference Call

**Scoping Session Purpose:** To discuss the Phase II RI Work Plan

NAME	TITLE	AFFILIATION	TELEPHONE NUMBER	E-MAIL ADDRESS	PROJECT ROLE
Sam Chummar	Remedial Project Manager	U.S. EPA Region 5	312.353.8983	chummar.sam@epa.gov	U.S. EPA Project Manager
Richard Gay	Environmental Manager	Weyerhaeuser	501.624.8554	richard.gay@weyerhaeuser.com	Weyerhaeuser Environmental Manager
Martin Lebo	Senior Aquatic Scientist	Weyerhaeuser	252.633.7511	martin.lebo@weyerhaeuser.com	Technical Assistance
Gregory Carli	Project Manager	CRA	716.297.6150	gcarli@croworld.com	CRA Project Manager
Jennifer Quigley	Project Coordinator	CRA	517.317.2397	jquigley@croworld.com	CRA Project Coordinator

**QAPP Worksheet #9-6  
Project Scoping Session Participants Sheet (May/June, 2009)**

**Comments/Decisions:**

- Discussion and comment regarding the proposed analyte list.
- As applicable, Weyerhaeuser will identify potential scenarios under which field modifications (e.g., additional test pits, changes in location or methods) may be needed.

**Action Items:**

- Respond to Comments and submit the revised Work Plan – completed (05/20/2009)

**Consensus Decisions:**

- Characterization of material for offsite disposal will include a PID measurements.
- Characterization of material selected for disposal will be disposed of properly according to applicable state and federal regulations.
- Need to submit a full work plan for the Plainwell Mill RI/FS.

**QAPP Worksheet #12-1  
Measurement Performance Criteria (PCBs - Surface Water)**

<b>Matrix:</b> <u>    Aqueous    </u> <b>Analytical Group:</b> <u>    PCBs    </u> <b>Concentration Level:</b> <u>    All    </u>					
SAMPLING PROCEDURE <sup>(1)</sup>	ANALYTICAL METHOD/SOP <sup>(2)</sup>	DATA QUALITY INDICATORS (DQIs)	MEASUREMENT PERFORMANCE CRITERIA	QC SAMPLE AND/OR ACTIVITY USED TO ASSESS MEASUREMENT PERFORMANCE	QC SAMPLE ASSESSES ERROR FOR SAMPLING(S), ANALYTICAL(A), OR BOTH (S&A)
F-16	W-1, C-13	Precision - Overall	Relative percent difference (RPD) < 50%	Field duplicate	S&A
		Accuracy/Bias	% Recovery (%R) laboratory-generated limits <sup>(3)</sup>	Surrogate	A
		Accuracy/Bias Contamination	< Reporting limit (RL)	Blanks (field, equipment, method)	S&A
		Accuracy/Bias	%R laboratory-generated limits <sup>(*)</sup>	Laboratory control sample (LCS)	A
		Accuracy/Bias and Precision	Retention times, see analytical SOP	Retention time windows	A
		Accuracy/Bias	%R, same as LCS <sup>(*)</sup>	Matrix spike (MS) <sup>(3)</sup>	A
		Accuracy/Bias	%R, same as LCS <sup>(*)</sup>	Matrix spike duplicate (MSD) or laboratory control sample duplicate (LCSD) <sup>(3)</sup>	A
		Precision	RPD laboratory-generated limits <sup>(3)</sup>	MS/MSD or LCS/LCSD <sup>(3)</sup>	A

**QAPP Worksheet #12-1**  
**Measurement Performance Criteria (PCBs - Surface Water)**

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**Footnotes:**

- <sup>(1)</sup> Reference number from QAPP Worksheet #21. See the project-specific Field Sampling Plan for sampling procedures.
  - <sup>(2)</sup> Reference number from QAPP Worksheet #23.
  - <sup>(3)</sup> MS and MSD must be client-provided. LCS/LCSD performed when no MS/MSD is supplied.
  - <sup>(4)</sup> See Attachments 1-1 and 1-2.
- RPD = relative percent difference.

**QAPP Worksheet #12-2  
Measurement Performance Criteria (Wet Chemistry - Surface Water)**

<b>Matrix:</b> <u>Water</u>					
<b>Analytical Group:</b> <u>Wet chemistry</u>					
<b>Concentration Level:</b> <u>All</u>					
SAMPLING PROCEDURE <sup>(1)</sup>	ANALYTICAL METHOD/SOP <sup>(2)</sup>	DATA QUALITY INDICATORS (DQIs)	MEASUREMENT PERFORMANCE CRITERIA	QC SAMPLE AND/OR ACTIVITY USED TO ASSESS MEASUREMENT PERFORMANCE	QC SAMPLE ASSESSES ERROR FOR SAMPLING(S), ANALYTICAL(A), OR BOTH (S&A)
F-16	W-2, W-3, W-5, W-26	Precision - Overall	RPD < 50%	Field duplicate	S&A
		Accuracy/Bias Contamination	< RL	Blanks (field, equipment, calibration, preparation)	S&A
		Accuracy/Bias	%R (90-110)	Continuing calibration verification	A
		Accuracy/Bias	%R (75-125)	MS <sup>(3)</sup>	A
		Accuracy/Bias	%R (75-125)	MSD <sup>(3)</sup>	A
		Precision	%R < 20%	MS/MSD <sup>(3)</sup>	A
		Accuracy/Bias	%R laboratory-generated limit <sup>(4)</sup>	LCS	A

**Footnotes:**

<sup>(1)</sup> Reference number from QAPP Worksheet #21. See the project-specific Field sampling Plan for sampling procedures.

<sup>(2)</sup> Reference number from QAPP Worksheet #23.

<sup>(3)</sup> MS and MSD not applicable for TSS

<sup>(4)</sup> See Attachment 1-1.

**QAPP Worksheet #12-3  
Measurement Performance Criteria (PCBs - Soil/Sediment)**

<b>Matrix:</b> <u>Soil/Sediment</u>					
<b>Analytical Group:</b> <sup>(1)</sup> <u>PCBs</u>					
<b>Concentration Level:</b> <u>All</u>					
SAMPLING PROCEDURE <sup>(2)</sup>	ANALYTICAL METHOD/SOP <sup>(3)</sup>	DATA QUALITY INDICATORS (DQIs)	MEASUREMENT PERFORMANCE CRITERIA	QC SAMPLE AND/OR ACTIVITY USED TO ASSESS MEASUREMENT PERFORMANCE	QC SAMPLE ASSESSES ERROR FOR SAMPLING(S), ANALYTICAL(A), OR BOTH (S&A)
F-4, F-5, F-6	W-4, C-13	Precision-Overall	RPD < 100%	Field duplicate	S&A
		Accuracy/Bias	%R, laboratory-generated limits <sup>(*)</sup>	Surrogate	A
		Accuracy/Bias Contamination	< RL	Blanks (field, equipment, method)	S&A
		Accuracy/Bias	%R, laboratory-generated limits <sup>(*)</sup>	LCS	A
		Accuracy/Bias and Precision	Retention times, see analytical SOP	Retention time windows	A
		Accuracy/Bias	%R, same as LCS <sup>(*)</sup>	MS <sup>(3)</sup>	A
		Accuracy/Bias	%R, same as LCS <sup>(*)</sup>	MSD or LCSD <sup>(3)</sup>	A
		Precision	%RPD laboratory-generated limits <sup>(3)</sup>	MS/MSD or LCS/LCSD <sup>(3)</sup>	A

**QAPP Worksheet #12-3**  
**Measurement Performance Criteria (PCBs - Soil/Sediment)**

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**Footnotes:**

- (1) Reference number from QAPP Worksheet #21. See the project-specific Field Sampling Plan for sampling procedures.
- (2) Reference number from QAPP Worksheet #23.
- (3) MS and MSD must be client-provided. LCS/LCSD performed when no MS/MSD is supplied.
- (\*) See Attachments 1-1 and 1-2.

**QAPP Worksheet #12-4  
Measurement Performance Criteria (PCBs – Free Product)**

<b>Matrix:</b> <u>Free Product</u>					
<b>Analytical Group:</b> <u>PCBs</u>					
<b>Concentration Level:</b> <u>All</u>					
SAMPLING PROCEDURE <sup>(1)</sup>	ANALYTICAL METHOD/SOP <sup>(2)</sup>	DATA QUALITY INDICATORS (DQIs)	MEASUREMENT PERFORMANCE CRITERIA <sup>(3)</sup>	QC SAMPLE AND/OR ACTIVITY USED TO ASSESS MEASUREMENT PERFORMANCE	QC SAMPLE ASSESSES ERROR FOR SAMPLING(S), ANALYTICAL(A), OR BOTH (S&A)
F-8	C-13, C-14, C-15	Precision-Overall	RPD < 100%	Field duplicate	S&A
		Accuracy/Bias	%R, laboratory-generated limits <sup>(6)</sup>	Surrogate	A
		Accuracy/Bias Contamination	< 2 x MDL	Blanks (field, equipment, method)	S&A
		Accuracy/Bias	%R, laboratory-generated limits <sup>(6)</sup>	LCS	A
		Accuracy/Bias	%R, laboratory-generated limits <sup>(6)</sup>	MS <sup>(4)</sup>	A
		Accuracy/Bias	%R, laboratory-generated limits <sup>(6)</sup>	MSD or LCSD <sup>(4)</sup>	A
		Precision	RPD laboratory-generated limits <sup>(3)</sup>	MS/MSD or LCS/LCSD <sup>(4)</sup>	A

**Footnotes:**

<sup>(1)</sup> Reference number from QAPP Worksheet #21. See the project-specific Field Sampling Plan for sampling procedures.

<sup>(2)</sup> Reference number from QAPP Worksheet #23.

<sup>(3)</sup> Measurement performance criteria listed are current criteria at the time this document was created, but are subject to change as control limits are updated.

<sup>(4)</sup> MS and MSD must be client-provided. LCS/LCSD performed when no MS/MSD is supplied.

<sup>(6)</sup> See Attachments 1-1 and 1-2.

RPD = relative percent difference.

**QAPP Worksheet #12-5  
Measurement Performance Criteria (TAL Metals – Groundwater / SPLP Metals-Soil)**

<b>Matrix:</b> <u>Aqueous</u>					
<b>Analytical Group:</b> <u>TAL Metals / SPLP Metals</u>					
<b>Concentration Level:</b> <u>All (Except Low-Level Mercury)</u>					
SAMPLING PROCEDURE <sup>(1)</sup>	ANALYTICAL METHOD/SOP <sup>(2)</sup>	DATA QUALITY INDICATORS (DQIs)	MEASUREMENT PERFORMANCE CRITERIA <sup>(3)</sup>	QC SAMPLE AND/OR ACTIVITY USED TO ASSESS MEASUREMENT PERFORMANCE	QC SAMPLE ASSESSES ERROR FOR SAMPLING(S), ANALYTICAL(A), OR BOTH (S&A)
F-8 F-11, F-5, F-6	W-14, C-18, C-31, C-33	Precision-Overall	RPD < 100%	Field duplicate	S&A
		Accuracy/Bias Contamination	< RL	Blanks (field, equipment, method)	S&A
		Accuracy/Bias	%R, laboratory-generated limits <sup>(6)</sup>	LCS	A
		Precision	sample > 5 x QL; RPD ≤ 20% sample ≤ 5 x QL; No limit	Laboratory duplicate	A
		Accuracy/Bias	%R, laboratory-generated limits <sup>(6)</sup>	MS <sup>(4)</sup>	A
		Accuracy/Bias	%R, laboratory-generated limits <sup>(6)</sup>	MSD or LCSD <sup>(4)</sup>	A
		Precision	RPD laboratory-generated limits <sup>(3)</sup>	MS/MSD or LCS/LCSD <sup>(4)</sup>	A
		Accuracy	%R > 80%	Interference check sample	A
		Accuracy	RPD ≤ 10%	Serial dilution	A

**Footnotes:**

<sup>(1)</sup> Reference number from QAPP Worksheet #21. See the project-specific Field Sampling Plan for sampling procedures.

<sup>(2)</sup> Reference number from QAPP Worksheet #23.

<sup>(3)</sup> Measurement performance criteria listed are current criteria at the time this document was created, but are subject to change as control limits are updated.

<sup>(4)</sup> MS and MSD must be client-provided. LCS/LCSD performed when no MS/MSD is supplied.

<sup>(5)</sup> See Attachments 1-1

RPD = relative percent difference.

**QAPP Worksheet #12-6  
Measurement Performance Criteria (TAL Metals-Soil)**

<b>Matrix:</b> <u>Soil</u>					
<b>Analytical Group:</b> <u>TAL Metals</u>					
<b>Concentration Level:</b> <u>All (Except Low-Level Mercury)</u>					
SAMPLING PROCEDURE <sup>(1)</sup>	ANALYTICAL METHOD/SOP <sup>(2)</sup>	DATA QUALITY INDICATORS (DQIs)	MEASUREMENT PERFORMANCE CRITERIA <sup>(3)</sup>	QC SAMPLE AND/OR ACTIVITY USED TO ASSESS MEASUREMENT PERFORMANCE	QC SAMPLE ASSESSES ERROR FOR SAMPLING(S), ANALYTICAL(A), OR BOTH (S&A)
F-5, F-6	W-14, C-18, C-31, C-32	Precision-Overall	RPD < 100%	Field duplicate	S&A
		Accuracy/Bias Contamination	< RL	Blanks (field, equipment, method)	S&A
		Accuracy/Bias	%R, laboratory-generated limits <sup>(*)</sup>	LCS	A
		Precision	sample > 5 x QL; RPD ≤ 20% sample ≤ 5 x QL; No limit	Laboratory duplicate	A
		Accuracy/Bias	%R, laboratory-generated limits <sup>(*)</sup>	MS <sup>(4)</sup>	A
		Accuracy/Bias	%R, laboratory-generated limits <sup>(*)</sup>	MSD or LCSD <sup>(4)</sup>	A
		Precision	%RPD laboratory-generated limits <sup>(3)</sup>	MS/MSD or LCS/LCSD <sup>(4)</sup>	A
		Accuracy	%R > 80%	Interference check sample	A
		Accuracy	RPD ≤ 10%	Serial dilution	A

**Footnotes:**

<sup>(1)</sup> Reference number from QAPP Worksheet #21. See the project-specific Field Sampling Plan for sampling procedures.

<sup>(2)</sup> Reference number from QAPP Worksheet #23.

<sup>(3)</sup> Measurement performance criteria listed are current criteria at the time this document was created, but are subject to change as control limits are updated.

<sup>(4)</sup> MS and MSD must be client-provided. LCS/LCSD performed when no MS/MSD is supplied.

<sup>(\*)</sup> See Attachments 1-1

RPD = relative percent difference.

**QAPP Worksheet #12-7  
Measurement Performance Criteria (Cyanide - Groundwater)**

<b>Matrix:</b> <u>Aqueous</u>					
<b>Analytical Group:</b> <u>Cyanide</u>					
<b>Concentration Level:</b> <u>All, total</u>					
SAMPLING PROCEDURE <sup>(1)</sup>	ANALYTICAL METHOD/SOP <sup>(2)</sup>	DATA QUALITY INDICATORS (DQIs)	MEASUREMENT PERFORMANCE CRITERIA <sup>(3)</sup>	QC SAMPLE AND/OR ACTIVITY USED TO ASSESS MEASUREMENT PERFORMANCE	QC SAMPLE ASSESSES ERROR FOR SAMPLING(S), ANALYTICAL(A), OR BOTH (S&A)
F-8, F-11	W-24, C-19	Precision-Overall	RPD < 100%	Field duplicate	S&A
		Accuracy/Bias Contamination	< RL	Blanks (field, equipment, method)	S&A
		Accuracy/Bias	%R, laboratory-generated limits	LCS	A
		Precision	%RPD <20%	Laboratory duplicate	A
		Accuracy/Bias	%R, laboratory-generated limits <sup>(*)</sup>	MS <sup>(4)</sup>	A
		Accuracy/Bias	%R, laboratory-generated limits <sup>(*)</sup>	MSD or LCSD <sup>(4)</sup>	A
		Precision	%RPD <20%	MS/MSD or LCS/LCSD <sup>(4)</sup>	A

**Footnotes:**

<sup>(1)</sup> Reference number from QAPP Worksheet #21. See the project-specific Field Sampling Plan for sampling procedures.

<sup>(2)</sup> Reference number from QAPP Worksheet #23.

<sup>(3)</sup> Measurement performance criteria listed are current criteria at the time this document was created, but are subject to change as control limits are updated.

<sup>(4)</sup> MS and MSD must be client-provided. LCS/LCSD performed when no MS/MSD is supplied.

<sup>(\*)</sup> See Attachments 1-1.

RPD = relative percent difference.

**QAPP Worksheet #12-8  
Measurement Performance Criteria (Cyanide - Soil)**

<b>Matrix:</b> <u>Soil</u>					
<b>Analytical Group:</b> <u>Cyanide</u>					
<b>Concentration Level:</b> <u>All, total</u>					
SAMPLING PROCEDURE <sup>(1)</sup>	ANALYTICAL METHOD/SOP <sup>(2)</sup>	DATA QUALITY INDICATORS (DQIs)	MEASUREMENT PERFORMANCE CRITERIA <sup>(3)</sup>	QC SAMPLE AND/OR ACTIVITY USED TO ASSESS MEASUREMENT PERFORMANCE	QC SAMPLE ASSESSES ERROR FOR SAMPLING(S), ANALYTICAL(A), OR BOTH (S&A)
F-5, F-6	W-25, C-19	Precision-Overall	RPD < 100%	Field duplicate	S&A
		Accuracy/Bias Contamination	< RL	Blanks (field, equipment, method)	S&A
		Accuracy/Bias	%R, laboratory-generated limits	LCS	A
		Precision	%RPD <20%	Laboratory duplicate	A
		Accuracy/Bias	%R, laboratory-generated limits <sup>(*)</sup>	MS <sup>(4)</sup>	A
		Accuracy/Bias	%R, laboratory-generated limits <sup>(*)</sup>	MSD or LCSD <sup>(4)</sup>	A
		Precision	%RPD <20%	MS/MSD or LCS/LCSD <sup>(4)</sup>	A

Footnotes:

- (1) Reference number from QAPP Worksheet #21. See the project-specific Field Sampling Plan for sampling procedures.
  - (2) Reference number from QAPP Worksheet #23.
  - (3) Measurement performance criteria listed are current criteria at the time this document was created, but are subject to change as control limits are updated.
  - (4) MS and MSD must be client-provided. LCS/LCSD performed when no MS/MSD is supplied.
  - (\*) See Attachments 1-1.
- RPD = relative percent difference.

**QAPP Worksheet #12-9  
Measurement Performance Criteria (Low-Level Mercury and Methyl Mercury - Groundwater)**

<b>Matrix:</b> <u>Aqueous</u>					
<b>Analytical Group:</b> <u>Mercury</u>					
<b>Concentration Level:</b> <u>Low-Level</u>					
SAMPLING PROCEDURE <sup>(1)</sup>	ANALYTICAL METHOD/SOP <sup>(2)</sup>	DATA QUALITY INDICATORS (DQIs)	MEASUREMENT PERFORMANCE CRITERIA <sup>(3)</sup>	QC SAMPLE AND/OR ACTIVITY USED TO ASSESS MEASUREMENT PERFORMANCE	QC SAMPLE ASSESSES ERROR FOR SAMPLING(S), ANALYTICAL(A), OR BOTH (S&A)
F-8, F-11	C-4, C-7, C-33	Precision-Overall	RPD < 100%	Field duplicate	S&A
		Accuracy/Bias Contamination	< RL	Blanks (field, equipment, method)	S&A
		Accuracy/Bias	%R, laboratory-generated limits <sup>(*)</sup>	LCS	A
		Precision	RPD	Laboratory duplicate	A
		Accuracy/Bias	%R, laboratory-generated limits <sup>(*)</sup>	MS <sup>(4)</sup>	A
		Accuracy/Bias	%R, laboratory-generated limits <sup>(*)</sup>	MSD or LCSD <sup>(4)</sup>	A
		Precision	%RPD <24%	MS/MSD or LCS/LCSD <sup>(4)</sup>	A

**Footnotes:**

- <sup>(1)</sup> Reference number from QAPP Worksheet #21. See the project-specific Field Sampling Plan for sampling procedures.
  - <sup>(2)</sup> Reference number from QAPP Worksheet #23.
  - <sup>(3)</sup> Measurement performance criteria listed are current criteria at the time this document was created, but are subject to change as control limits are updated.
  - <sup>(4)</sup> MS and MSD must be client-provided. LCS/LCSD performed when no MS/MSD is supplied.
  - <sup>(\*)</sup> See Attachments 1-1
- RPD = relative percent difference.

**QAPP Worksheet #12-10  
Measurement Performance Criteria (SVOCs - Groundwater)**

<b>Matrix:</b> <u>Aqueous</u>					
<b>Analytical Group:</b> <u>SVOCs</u>					
<b>Concentration Level:</b> <u>All</u>					
SAMPLING PROCEDURE <sup>(1)</sup>	ANALYTICAL METHOD/SOP <sup>(2)</sup>	DATA QUALITY INDICATORS (DQIs)	MEASUREMENT PERFORMANCE CRITERIA <sup>(3)</sup>	QC SAMPLE AND/OR ACTIVITY USED TO ASSESS MEASUREMENT PERFORMANCE	QC SAMPLE ASSESSES ERROR FOR SAMPLING(S), ANALYTICAL(A), OR BOTH (S&A)
F-8, F-11	W-15, C-20	Precision-Overall	RPD < 100%	Field duplicate	S&A
		Accuracy/Bias Contamination	< RL	Blanks (field, equipment, method)	S&A
		Accuracy/Bias	%R, Laboratory-generated limits <sup>(*)</sup>	LCS	A
		Accuracy/Bias	%R, Laboratory-generated limits <sup>(*)</sup>	MS <sup>(4)</sup>	A
		Accuracy/Bias	%R, Laboratory-generated limits <sup>(*)</sup>	MSD or LCSD <sup>(4)</sup>	A
		Precision	%RPD laboratory-generated limits <sup>(3)</sup>	MS/MSD or LCS/LCSD <sup>(4)</sup>	A
		Accuracy/Bias	%R, Laboratory-generated limits <sup>(*)</sup>	Surrogates	A
		Accuracy/Bias	+100%, -50% of ICAL	Internal standards	A
		Accuracy/Bias	Established mass limits	DFTPP Tuning	A

**Footnotes:**

- <sup>(1)</sup> Reference number from QAPP Worksheet #21. See the project-specific Field Sampling Plan for sampling procedures.
  - <sup>(2)</sup> Reference number from QAPP Worksheet #23.
  - <sup>(3)</sup> Measurement performance criteria listed are current criteria at the time this document was created, but are subject to change as control limits are updated.
  - <sup>(4)</sup> MS and MSD must be client-provided. LCS/LCSD performed when no MS/MSD is supplied.
  - <sup>(\*)</sup> See Attachments 1-1 and 1-2.
- RPD = relative percent difference.

**QAPP Worksheet #12-11  
Measurement Performance Criteria (SVOCs - Soil)**

<b>Matrix:</b> <u>Soil</u>					
<b>Analytical Group:</b> <u>SVOCs</u>					
<b>Concentration Level:</b> <u>All</u>					
SAMPLING PROCEDURE <sup>(1)</sup>	ANALYTICAL METHOD/SOP <sup>(2)</sup>	DATA QUALITY INDICATORS (DQIs)	MEASUREMENT PERFORMANCE CRITERIA <sup>(3)</sup>	QC SAMPLE AND/OR ACTIVITY USED TO ASSESS MEASUREMENT PERFORMANCE	QC SAMPLE ASSESSES ERROR FOR SAMPLING(S), ANALYTICAL(A), OR BOTH (S&A)
F-5, F-6	W-15, C-20	Precision-Overall	RPD < 100%	Field duplicate	S&A
		Accuracy/Bias Contamination	< RL	Blanks (field, equipment, method)	S&A
		Accuracy/Bias	%R, Laboratory-generated limits <sup>(*)</sup>	LCS	A
		Accuracy/Bias	%R, Laboratory-generated limits <sup>(*)</sup>	MS <sup>(4)</sup>	A
		Accuracy/Bias	%R, Laboratory-generated limits <sup>(*)</sup>	MSD or LCSD <sup>(4)</sup>	A
		Precision	%RPD laboratory-generated limits <sup>(3)</sup>	MS/MSD or LCS/LCSD <sup>(4)</sup>	A
		Accuracy/Bias	%R, Laboratory-generated limits <sup>(*)</sup>	Surrogates	A
		Accuracy/Bias	+100%, -50% of ICAL	Internal standards	A
		Accuracy/Bias	Established mass limits	DFTPP Tuning	A

**Footnotes:**

- <sup>(1)</sup> Reference number from QAPP Worksheet #21. See the project-specific Field Sampling Plan for sampling procedures.
  - <sup>(2)</sup> Reference number from QAPP Worksheet #23.
  - <sup>(3)</sup> Measurement performance criteria listed are current criteria at the time this document was created, but are subject to change as control limits are updated.
  - <sup>(4)</sup> MS and MSD must be client-provided. LCS/LCSD performed when no MS/MSD is supplied.
  - <sup>(\*)</sup> See Attachments 1-1 and 1-2.
- RPD = relative percent difference.

**QAPP Worksheet #12-12  
Measurement Performance Criteria (VOCs - Groundwater)**

<b>Matrix:</b> <u>Aqueous</u>					
<b>Analytical Group:</b> <u>VOCs</u>					
<b>Concentration Level:</b> <u>All</u>					
SAMPLING PROCEDURE <sup>(1)</sup>	ANALYTICAL METHOD/SOP <sup>(2)</sup>	DATA QUALITY INDICATORS (DQIs)	MEASUREMENT PERFORMANCE CRITERIA <sup>(3)</sup>	QC SAMPLE AND/OR ACTIVITY USED TO ASSESS MEASUREMENT PERFORMANCE	QC SAMPLE ASSESSES ERROR FOR SAMPLING(S), ANALYTICAL(A), OR BOTH (S&A)
F-8, F-11	W-21, C-5	Precision-Overall	RPD < 100%	Field duplicate	S&A
		Accuracy/Bias Contamination	< RL	Blanks (field, equipment, method)	S&A
		Accuracy/Bias	%R, laboratory-generated limits <sup>(6)</sup>	LCS	A
		Accuracy/Bias	%R, laboratory-generated limits <sup>(6)</sup>	MS <sup>(4)</sup>	A
		Accuracy/Bias	%R, laboratory-generated limits <sup>(6)</sup>	MSD or LCSD <sup>(4)</sup>	A
		Precision	%RPD <20%	MS/MSD or LCS/LCSD <sup>(4)</sup>	A
		Accuracy/Bias	%R, laboratory-generated limits <sup>(6)</sup>	Surrogates	A
		Accuracy/Bias	+100%, -50% of ICAL	Internal standards	A
		Accuracy/Bias	Established mass limits	BFB Tuning	A

**Footnotes:**

- <sup>(1)</sup> Reference number from QAPP Worksheet #21. See the project-specific Field Sampling Plan for sampling procedures.
  - <sup>(2)</sup> Reference number from QAPP Worksheet #23.
  - <sup>(3)</sup> Measurement performance criteria listed are current criteria at the time this document was created, but are subject to change as control limits are updated.
  - <sup>(4)</sup> MS and MSD must be client-provided. LCS/LCSD performed when no MS/MSD is supplied.
  - <sup>(6)</sup> See Attachments 1-1 and 1-2.
- RPD = relative percent difference.

**QAPP Worksheet #12-13  
Measurement Performance Criteria (VOCs - Soil)**

<b>Matrix:</b> <u>Soil</u>					
<b>Analytical Group:</b> <u>VOCs</u>					
<b>Concentration Level:</b> <u>All</u>					
SAMPLING PROCEDURE <sup>(1)</sup>	ANALYTICAL METHOD/SOP <sup>(2)</sup>	DATA QUALITY INDICATORS (DQIs)	MEASUREMENT PERFORMANCE CRITERIA <sup>(3)</sup>	QC SAMPLE AND/OR ACTIVITY USED TO ASSESS MEASUREMENT PERFORMANCE	QC SAMPLE ASSESSES ERROR FOR SAMPLING(S), ANALYTICAL(A), OR BOTH (S&A)
F-5, F-6	C-5	Precision-Overall	RPD < 100%	Field duplicate	S&A
		Accuracy/Bias Contamination	< RL	Blanks (field, equipment, method)	S&A
		Accuracy/Bias	%R, laboratory-generated limits <sup>(*)</sup>	LCS	A
		Accuracy/Bias	%R, laboratory-generated limits <sup>(*)</sup>	MS <sup>(4)</sup>	A
		Accuracy/Bias	%R, laboratory-generated limits <sup>(*)</sup>	MSD or LCSD <sup>(4)</sup>	A
		Precision	%RPD <40%	MS/MSD or LCS/LCSD <sup>(4)</sup>	A
		Accuracy/Bias	%R, laboratory-generated limits <sup>(*)</sup>	Surrogates	A
		Accuracy/Bias	Established mass limits	BFB Tuning	A

**Footnotes:**

- <sup>(1)</sup> Reference number from QAPP Worksheet #21. See the project-specific Field Sampling Plan for sampling procedures.
  - <sup>(2)</sup> Reference number from QAPP Worksheet #23.
  - <sup>(3)</sup> Measurement performance criteria listed are current criteria at the time this document was created, but are subject to change as control limits are updated.
  - <sup>(4)</sup> MS and MSD must be client-provided. LCS/LCSD performed when no MS/MSD is supplied.
  - <sup>(\*)</sup> See Attachments 1-1 and 1-2.
- RPD = relative percent difference.

**QAPP Worksheet #12-14  
Measurement Performance Criteria (DRO & GRO - Soil)**

<b>Matrix:</b> <u>Soil</u>					
<b>Analytical Group:</b> <u>DRO, GRO</u>					
<b>Concentration Level:</b> <u>All</u>					
SAMPLING PROCEDURE <sup>(1)</sup>	ANALYTICAL METHOD/SOP <sup>(2)</sup>	DATA QUALITY INDICATORS (DQIs)	MEASUREMENT PERFORMANCE CRITERIA <sup>(3)</sup>	QC SAMPLE AND/OR ACTIVITY USED TO ASSESS MEASUREMENT PERFORMANCE	QC SAMPLE ASSESSES ERROR FOR SAMPLING(S), ANALYTICAL(A), OR BOTH (S&A)
F-5, F-6	W-22, C-23 (DRO)	Precision-Overall	RPD < 100%	Field duplicate	S&A
	W-23, C-22 (GRO)	Accuracy/Bias Contamination	< RL	Blanks (field, equipment, method)	S&A
		Accuracy/Bias	%R, Laboratory-generated limits	LCS	A
		Accuracy/Bias	%R, laboratory-generated limits <sup>(3)</sup>	MS	A
		Accuracy/Bias	%R, laboratory-generated limits <sup>(*)</sup>	MSD or LCSD <sup>(4)</sup>	A
		Precision	%RPD laboratory-generated limits <sup>(3)</sup>	MS/MSD or LCS/LCSD <sup>(4)</sup>	A
		Accuracy/Bias	%R, Laboratory-generated limits <sup>(*)</sup>	Surrogate	A

**Footnotes:**

- <sup>(1)</sup> Reference number from QAPP Worksheet #21. See the project-specific Field Sampling Plan for sampling procedures.
  - <sup>(2)</sup> Reference number from QAPP Worksheet #23.
  - <sup>(3)</sup> Measurement performance criteria listed are current criteria at the time this document was created, but are subject to change as control limits are updated.
  - <sup>(4)</sup> MS and MSD must be client-provided. LCS/LCSD performed when no MS/MSD is supplied.
  - <sup>(\*)</sup> See Attachments 1-1 and 1-2.
- RPD = relative percent difference. .

**QAPP Worksheet #12-15  
Measurement Performance Criteria (Wet Chemistry – Soil)**

<b>Matrix:</b> <u>Soil</u>					
<b>Analytical Group:</b> <u>Wet chemistry</u>					
<b>Concentration Level:</b> <u>All</u>					
SAMPLING PROCEDURE <sup>(1)</sup>	ANALYTICAL METHOD/SOP <sup>(2)</sup>	DATA QUALITY INDICATORS (DQIs)	MEASUREMENT PERFORMANCE CRITERIA	QC SAMPLE AND/OR ACTIVITY USED TO ASSESS MEASUREMENT PERFORMANCE	QC SAMPLE ASSESSES ERROR FOR SAMPLING(S), ANALYTICAL(A), OR BOTH (S&A)
F-5, F-6	C-8, C-9 and C-10	Precision - Overall	RPD < 100%	Field duplicate	S&A
		Accuracy/Bias Contamination	< RL	Blanks (field, equipment, calibration, preparation)	S&A
		Accuracy/Bias	%R laboratory-generated limit <sup>(*)</sup>	Continuing calibration verification	A
		Accuracy/Bias	%R laboratory-generated limit <sup>(*)</sup>	MS <sup>(3)</sup>	A
		Accuracy/Bias	%R laboratory-generated limit <sup>(*)</sup>	MSD <sup>(3)</sup>	A
		Precision	%R laboratory-generated limit <sup>(*)</sup>	MS/MSD <sup>(3)</sup>	A
		Accuracy/Bias	%R laboratory-generated limit <sup>(*)</sup>	LCS	A

**Footnotes:**

- <sup>(1)</sup> Reference number from QAPP Worksheet #21. See the project-specific Field sampling Plan for sampling procedures.
- <sup>(2)</sup> Reference number from QAPP Worksheet #23.
- <sup>(3)</sup> MS and MSD not applicable for Nitrogen compounds (Ammonia-N, Nitrate and Nitrite) and phosphorous.
- <sup>(\*)</sup> See Attachment 1-1.

**QAPP Worksheet #12-16  
Measurement Performance Criteria (Low-Level Mercury and Methyl Mercury – Surface Water)**

<b>Matrix:</b> <u>Aqueous</u>					
<b>Analytical Group:</b> <u>Mercury</u>					
<b>Concentration Level:</b> <u>Low-Level</u>					
SAMPLING PROCEDURE <sup>(1)</sup>	ANALYTICAL METHOD/SOP <sup>(2)</sup>	DATA QUALITY INDICATORS (DQIs)	MEASUREMENT PERFORMANCE CRITERIA <sup>(3)</sup>	QC SAMPLE AND/OR ACTIVITY USED TO ASSESS MEASUREMENT PERFORMANCE	QC SAMPLE ASSESSES ERROR FOR SAMPLING(S), ANALYTICAL(A), OR BOTH (S&A)
F-16	C-4, C-7, C-33	Precision-Overall	RPD < 100%	Field duplicate	S&A
		Accuracy/Bias Contamination	< RL	Blanks (field, equipment, method)	S&A
		Accuracy/Bias	%R, laboratory-generated limits <sup>(5)</sup>	LCS	A
		Precision	RPD, laboratory-generated limits	Laboratory duplicate	A
		Accuracy/Bias	%R, laboratory-generated limits <sup>(5)</sup>	MS <sup>(4)</sup>	A
		Accuracy/Bias	%R, laboratory-generated limits <sup>(5)</sup>	MSD or LCSD <sup>(4)</sup>	A
		Precision	%R, laboratory-generated limits <sup>(5)</sup>	MS/MSD or LCS/LCSD <sup>(4)</sup>	A

**Footnotes:**

- <sup>(1)</sup> Reference number from QAPP Worksheet #21. See the project-specific Field Sampling Plan for sampling procedures.
  - <sup>(2)</sup> Reference number from QAPP Worksheet #23.
  - <sup>(3)</sup> Measurement performance criteria listed are current criteria at the time this document was created, but are subject to change as control limits are updated.
  - <sup>(4)</sup> MS and MSD must be client-provided. LCS/LCSD performed when no MS/MSD is supplied.
  - <sup>(5)</sup> See Attachments 1-1 and 1-2.
- RPD = relative percent difference.

**QAPP Worksheet #12-17  
Measurement Performance Criteria (PCBs - Groundwater)**

<b>Matrix:</b> <u>    Aqueous    </u> <b>Analytical Group:</b> <u>    PCBs    </u> <b>Concentration Level:</b> <u>    All    </u>					
SAMPLING PROCEDURE <sup>(1)</sup>	ANALYTICAL METHOD/SOP <sup>(2)</sup>	DATA QUALITY INDICATORS (DQIs)	MEASUREMENT PERFORMANCE CRITERIA	QC SAMPLE AND/OR ACTIVITY USED TO ASSESS MEASUREMENT PERFORMANCE	QC SAMPLE ASSESSES ERROR FOR SAMPLING(S), ANALYTICAL(A), OR BOTH (S&A)
F-3, F-11, F-16	W-1, C-13	Precision - Overall	Relative percent difference (RPD) < 50%	Field duplicate	S&A
		Accuracy/Bias	% Recovery (%R) laboratory-generated limits <sup>(3)</sup>	Surrogate	A
		Accuracy/Bias Contamination	< Reporting limit (RL)	Blanks (field, equipment, method)	S&A
		Accuracy/Bias	%R laboratory-generated limits <sup>(*)</sup>	Laboratory control sample (LCS)	A
		Accuracy/Bias and Precision	Retention times, see analytical SOP	Retention time windows	A
		Accuracy/Bias	%R, same as LCS <sup>(*)</sup>	Matrix spike (MS) <sup>(3)</sup>	A
		Accuracy/Bias	%R, same as LCS <sup>(*)</sup>	Matrix spike duplicate (MSD) or laboratory control sample duplicate (LCSD) <sup>(3)</sup>	A
		Precision	RPD laboratory-generated limits <sup>(3)</sup>	MS/MSD or LCS/LCSD <sup>(3)</sup>	A

**QAPP Worksheet #12-17**  
**Measurement Performance Criteria (PCBs - Groundwater)**

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**Footnotes:**

<sup>(1)</sup> Reference number from QAPP Worksheet #21. See the project-specific Field Sampling Plan for sampling procedures.

<sup>(2)</sup> Reference number from QAPP Worksheet #23.

<sup>(3)</sup> MS and MSD must be client-provided. LCS/LCSD performed when no MS/MSD is supplied.

<sup>(4)</sup> See Attachments 1-1 and 1-2.

RPD = relative percent difference.

**QAPP Worksheet #14  
Summary of Project Tasks**

SAMPLING AND ANALYSIS TASKS	
<b>Emergency Response Activities in the Former Powerhouse Discharge Channel at the 12th Street Landfill (Operable Unit No. 4)</b>	
<b>Sampling tasks:</b>	<p>Sampling tasks will be performed as follows:</p> <ul style="list-style-type: none"> <li>Pre-excavation bathymetry measurements and sediment sampling to plan extent of sediment excavation (<i>i.e.</i>, analytical data for polychlorinated biphenyls (PCBs), visual characterization, and engineering data)</li> <li>Resuspension monitoring and control, including surface water sampling and field turbidity measurements</li> <li>Dewatering system discharge monitoring</li> <li>Post-excavation confirmation sampling for PCBs in channel sediment</li> <li>Global positioning system (GPS)-based survey of excavation limits and sampling locations</li> <li>Digital photographs</li> </ul>
<b>Analysis tasks:</b>	<p>Analytical samples will be processed, prepared, and analyzed, as follows:</p> <ul style="list-style-type: none"> <li>Resuspension monitoring and control (surface water)                             <ul style="list-style-type: none"> <li>PCBs by WATS</li> </ul> </li> <li>Dewatering system discharge monitoring (surface water)                             <ul style="list-style-type: none"> <li>PCBs, total suspended solids (TSS), and phosphorus by WATS</li> </ul> </li> <li>Post-excavation confirmation sampling (sediment)                             <ul style="list-style-type: none"> <li>PCBs by WATS</li> </ul> </li> </ul>
<b>Quality control tasks:</b>	The samples will be collected and processed, and the laboratory waste will be disposed of as described in the laboratory SOPs (Attachment 1-5). QA samples will be collected as described in Worksheet #26.
<b>Secondary data:</b>	See Worksheets #13-1 and #13-2.

**QAPP Worksheet #14  
Summary of Project Tasks**

SAMPLING AND ANALYSIS TASKS	
<b>Pre-design Investigations for the Remedial Design for the 12th Street Landfill (Operable Unit No. 4)</b>	
<b>Sampling tasks:</b>	Field data collection activities during the pre-design investigations will include: Visual information obtained by the advancement of test pits Visual information obtained by the advancement of Geoprobe® borings Gas concentrations (methane, carbon dioxide, and oxygen) measured in existing monitoring wells and in the Geoprobe® locations. Pressure measured in existing monitoring wells.
<b>Analysis tasks:</b>	No analytical data will be collected.
<b>Quality control tasks:</b>	No analytical data will be collected.
<b>Secondary data:</b>	See Worksheet #13-1.
<b>Phase 2 of Addendum No. 1 – Test Pits &amp; Plainwell Mill RI/FS – Phase I Initial Groundwater Assessment</b>	
<b>Sampling tasks:</b>	Sampling tasks will be performed as follows: <b>Phase 2 of Addendum No. 1</b> Approximately 15 test pits will be excavated along the banks of the Plainwell Mill buildings. Test pit excavation to determine extent of oil impacted soil and elevated concentrations of PCBs ( <i>i.e.</i> , analytical data for polychlorinated biphenyls (PCBs) & total petroleum hydrocarbons, visual characterization, and engineering data) Additional soil samples will be collected from the test pits for RCRA metals, VOCs, and PAHs If free product is observed a sample will be collected for general characteristics Global positioning system (GPS)–based survey of excavation limits and sampling locations Digital photographs <b>Plainwell Mill RI/FS – Phase I Initial Groundwater Assessment</b> Approximately 12 groundwater wells and three staff gages will be installed. Collect groundwater samples for RCRA metals, VOCs, PAHs, and PCBs Collect water elevations from three surface water staff gages (Two in the Kalamazoo River and One in the Mill Race) Global positioning system (GPS)–based survey of excavation limits and sampling locations Digital photographs

**QAPP Worksheet #14  
Summary of Project Tasks**

<b>Analysis tasks:</b>	<p>Analytical samples will be processed, prepared, and analyzed, as follows:</p> <p><b>Phase 2 of Addendum No. 1 - Test Pits Soil Samples</b></p> <ul style="list-style-type: none"> <li>PCBs by WATS</li> <li>RCRA Metals by WATS</li> <li>PAHs by WATS</li> <li>VOCs by Columbia Analytical Services</li> <li>Free Product Characterization (Specific Gravity &amp; Viscosity) – Summit Technologies, Inc.</li> <li>Total petroleum hydrocarbons (DRO/GRO) by WATS</li> </ul> <p><b>Plainwell Mill RI/FS – Initial Groundwater Assessment (Groundwater Samples)</b></p> <ul style="list-style-type: none"> <li>PCBs by WATS</li> <li>RCRA Metals by WATS <ul style="list-style-type: none"> <li>Hg by Columbia Analytical Services</li> </ul> </li> <li>PAHs by WATS</li> <li>VOCs by Columbia Analytical Services</li> </ul>
<b>Quality control tasks:</b>	<p>The samples will be collected and processed, and the laboratory waste will be disposed of as described in the laboratory SOPs (Attachment 1-5). QA samples will be collected as described in Worksheet #26.</p>
<b>Secondary data:</b>	<p>See Worksheets #13-1 and #13-2.</p>
<b>SAMPLING AND ANALYSIS TASKS</b>	
<b>Plainwell Mill Phase II Remedial Investigation Work Plan</b>	
<b>Sampling tasks:</b>	<p>Sampling tasks will be performed as follows:</p> <ul style="list-style-type: none"> <li>Advancement of soil boring and performing soil sampling as described in Worksheet# 18-5.</li> <li>Installation of monitoring wells at various location at the site.</li> <li>Performance of side-wide groundwater monitoring at existing and new monitoring locations.</li> <li>GPS-based survey of soil boring and groundwater monitoring locations.</li> <li>Collection of two surface water samples, one from millrace and one from Kalamazoo River.</li> <li>Digital photographs.</li> </ul>

**QAPP Worksheet #14  
Summary of Project Tasks**

<b>Analysis tasks:</b>	<p>Analytical samples will be processed, prepared, and analyzed, as follows:</p> <p>Surface water sampling:                  Low level mercury, methyl mercury by CAS, and hardness by WATS or CAS</p> <p>Soil sampling:                  TCL SVOCs, TAL Metals, SPLP Metals, and PCBs by WATS or CAS                  TCL VOCs and general chemistry by CAS</p> <p>Groundwater monitoring:                  TCL VOCs by WATS or CAS                  TCL SVOCs, PCBs, and TAL inorganics by WATS or CAS</p>
<b>Quality control tasks:</b>	<p>The samples will be collected and processed, and the laboratory waste will be disposed of as described in the laboratory SOPs (Attachment 1-5). QA samples will be collected as described in Worksheet #26.</p>
<b>Secondary data:</b>	<p>See Worksheets #13-1 and #13-2.</p>
<b>12th Street Landfill Remedial Action Work Plan</b>	
<b>Sampling tasks:</b>	<p>Sampling tasks will be performed as follows:</p> <p>Asphalt Plant Property                  Post- excavation soil sampling at the base of excavation and sidewalls of the excavated area.                  GPS-based survey of excavation limits and sampling locations.                  Digital photographs.</p> <p>MDNR Property                  Post- excavation soil sampling at the base of excavation and sidewalls of the excavated area                  GPS-based survey of excavation limits and sampling locations.                  Digital photographs.</p>
<b>Analysis tasks:</b>	<p>Analytical samples will be processed, prepared, and analyzed, as follows:</p> <p>Soil samples collected from Asphalt Plant Property:                  PCBs by WATS or CAS</p> <p>Soil sampling collected from MDNR Property                  TCL VOCs by CAS                  PCBs by WATS or CAS</p>

**QAPP Worksheet #14  
Summary of Project Tasks**

<b>Quality control tasks:</b>	The samples will be collected and processed, and the laboratory waste will be disposed of as described in the laboratory SOPs (Attachment 1-5). QA samples will be collected as described in Worksheet #26.
<b>Secondary data:</b>	See Worksheets #13-1 and #13-2.
<b>DATA MANAGEMENT, DOCUMENTATION, RECORDS, AND AUDIT TASKS</b>	
<b>Data management tasks:</b>	<p><b>Field data reduction</b> - Raw data from field measurements and sample collection activities will be recorded as specified in the FSP. If the data are to be used in the project reports, they will be reduced or summarized, and the method of reduction will be documented in the report. With the exception of the temperature correction for specific conductance, no calculation will be involved in field data reduction. Only direct-reading instrumentation will be employed in the field. The On-Site Coordinator or designee will proofread all forms and notebooks to determine if transcription errors have been made by the field crew.</p> <p><b>Laboratory data reduction</b> - WATS or subcontracted laboratory (i.e., CAS) will perform in-house analytical data reduction under the direction of the laboratory QA/QC Manager. The laboratory QA/QC Manager will be responsible for assessing data quality and advising of any data that were rated “preliminary” or “unacceptable” or of other notations that would caution the data user of possible unreliability. Data reduction, by the laboratory, will be conducted as follows:</p> <p style="padding-left: 40px;">The analysts who produced the laboratory data will first conduct a systematic review (Level 1 Review).</p> <p style="padding-left: 40px;">An experienced peer, supervisor, or designee will examine the data (the Level 2 Review) to ensure that the Level 1 review has been completed correctly and thoroughly. Following the Level 2 review, the data will be turned over to the Laboratory Project Manager for a third-level review.</p> <p style="padding-left: 40px;">The Project Manager will review the data for completeness and attainment of quality control criteria as outlined in the U.S. EPA methods and for overall reasonableness.</p> <p style="padding-left: 40px;">The Project Manager will verify the accuracy and completeness of the final reports.</p> <p style="padding-left: 40px;">The Laboratory QA/QC Manager and the supervisor of the pertinent analytical section, in conjunction with the CRA QA Officer, will decide whether any sample reanalysis is required.</p> <p style="padding-left: 40px;">Data reduction procedures are included in the U.S. EPA-approved methods and associated laboratory SOPs.</p> <p><b>Field data reporting</b> - Field data reporting will consist of field logs and calibration and measurement records documenting site activities as described in the FSP and on the sample Chain-of-Custody (COC) Records.</p>

### QAPP Worksheet #14 Summary of Project Tasks

<p><b>Data management tasks:</b> <i>(continued)</i></p>	<p><b>Laboratory data reporting</b> - The analytical laboratories will prepare and retain full analytical and QC documentation. Such retained documentation need not be on hard (paper) copy, but may be in other storage media (<i>e.g.</i>, computer diskette or magnetic tape). As needed, WATS or subcontractor laboratory (<i>i.e.</i>, CAS) will supply a hard copy of the retained information.</p> <p>WATS or subcontractor laboratory (<i>i.e.</i>, CAS) will provide the following information in each analytical data package submitted:</p> <ul style="list-style-type: none"><li>Dated cover sheets, signed by the WATS or subcontractor laboratory (<i>i.e.</i>, CAS) Laboratory Manager, listing a laboratory batch number; the analyses performed; the number of samples and respective matrices; the project name and number; narrative comments describing deviations from intended analytical strategy, and any problems encountered in analysis; a discussion of any laboratory quality control checks that failed to meet project criteria; and the signature of the laboratory QA/QC Manager</li><li>Tabulated results of inorganic and organic compounds identified and quantified, including sample preparation and analysis dates, and cross-references of laboratory and field sample identification numbers</li><li>Analytical results for QC sample spikes and sample duplicates; initial and continuing calibration verifications of standards and blanks; standard procedural blanks; laboratory control samples; and the data produced by ICP interference check samples, as appropriate for the specified analyses</li><li>Tabulation of Method Detection Limits, as appropriate</li><li>Raw data system printouts (or legible photocopies) identifying the date of analyses, the mass spectra tuning data, the name of the analyst, the parameters determined, the initial and continuing calibration, the calibration verification summary, the method blanks, the sample and any dilutions, sample duplicates and spikes, chromatograms, GC/MS spectra, computer printouts, internal standard area and RT summary, cleanup information, control samples, ICP outputs, and inter-element correction data</li></ul> <p>WATS or subcontractor laboratory (<i>i.e.</i>, CAS) will provide the following information for the indicator parameters in each analytical data package submitted:</p> <ul style="list-style-type: none"><li>Dated cover sheets listing a laboratory batch number; the analyses performed; the number of samples and respective matrices; project name and number; narrative comments describing deviations from intended analytical strategy, and problems encountered in analysis; discussion of any laboratory quality control checks that failed to meet project criteria; and the signature of the Laboratory QA Manager</li><li>Copies of bench sheets that include summaries of initial calibration and continuing calibration check results</li><li>Summary of QC sample analysis (spikes, duplicates, laboratory control samples, and blanks).</li></ul> <p>A report will be prepared containing a QA/QC section summarizing the quality of the data. The QA report prepared by the CRA will address the assessment of data precision, accuracy, completeness, and comparability; the results of performance audits, if any; the results of system audits; any reported nonconformances; any significant QA/QC problems and recommended solutions; the results of corrective actions since the last report; and approved revisions to the QA/QC processes. The report will indicate whether the QA objectives were met and whether the data can be used for the intended purposes based on an evaluation of compliance with control limits, the results of audits, and compliance with the procedures specified in the QAPP and the FSP.</p>
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### QAPP Worksheet #14 Summary of Project Tasks

<b>Documentation and records:</b>	<p>Appropriate records will be maintained to provide adequate documentation of the entire data generation process, including field sampling and laboratory analysis.</p> <p><b>Field documentation</b> - Field personnel will develop and retain comprehensive records of field activities, including field sampling, field analysis, and sample COC Record, to allow a reconstruction of field events and sample handling during data review and interpretation.</p> <p><b>Laboratory project files</b> - WATS or subcontractor laboratory (i.e. CAS) will maintain a file for pertinent project information, including COC Records; other custody documents (air bills, etc.); work orders; Sample Receipt Acknowledgment Forms, if any; instrument detection limit and control limit tabulations; all raw analytical data on bench sheets; laboratory data; and project communication records. Such retained documentation need not be on hard (paper) copy, but may be in other storage media (e.g., computer diskette or magnetic tape). As needed, WATS or subcontractor laboratory (i.e., CAS) will supply a hard copy of the retained information.</p> <p><b>Laboratory notebooks</b> - Logbooks, bench sheets, instrument notebooks, and instrument printouts will be retained as part of the permanent laboratory record, including the associated quality controls. Each page in the laboratory logbooks and bench sheets will be signed and dated by the analyst, and errors will be crossed out in indelible ink. System printouts of raw inorganic and organic data will include dates of analyses; analyst's name; parameters determined; calibration curve; calibration verifications; method blanks; sample number and dilutions performed; and sample duplicates, spikes, and control samples. Internal laboratory QC sample results will be indicated on the analytical bench sheets and will include sample spikes, sample duplicates, initial and continuous calibration verification of standards and blanks, standard procedural blanks, laboratory control samples, ICP serial dilutions, and ICP interference check samples.</p> <p><b>Computer and hard copy storage</b> - All electronic files and deliverables will be retained by the laboratory for no less than 5 years. Weyerhaeuser, or its designated representatives, will retain copies of the analytical data reports according to the requirements of the laboratory QA Manual. All field records will be kept in the central project file at the CRA offices at St. Catharines, Waterloo, or Kalamazoo; and records will be included in project reports, as appropriate or upon request by the U.S. EPA RPM.</p> <p><b>Field data reporting</b> - Field data reporting will consist of field notebooks and logs, photographs, boring logs, calibration and measurement records, and COC documentation, including field quality control samples that will be collected to assess the quality of the analytical data and to evaluate sampling and analytical reproducibility. Field records will be reviewed by the CRA Project Manager for consistency with the planned activities, and any concerns will be discussed with the Field QA Officer. Field performance and field system audits will also be performed, as discussed below and in Worksheets #31 and 32.</p> <p><b>Laboratory data reporting</b> - Analytical data for this project will be reported in both an electronic data deliverable (EDD) and an analytical data package. The EDD will be generated by WATS or subcontractor laboratory (i.e. CAS) and will be used by CRA to facilitate loading the analytical data into the project database. The Laboratory QA/QC Manager will perform a final review of the report summaries and case narratives to determine if the report meets project requirements. The task of reporting laboratory data to the U.S. EPA will begin after the data review activity has been concluded. The validated analytical data will</p>
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### QAPP Worksheet #14 Summary of Project Tasks

**Documentation and records:**  
*(continued)*

be provided to the U.S. EPA in accordance with the project schedule (Worksheet #16). In addition to the COC Record, WATS or subcontractor laboratory (i.e. CAS) will prepare and provide a full "CLP-like" data package, including the following:

**Case narrative** - date of issuance; laboratory analysis performed; any deviations from required analytical methods; laboratory sample lot numbers; numbers of samples and respective matrices; QC procedures used and references to the acceptance criteria; laboratory report table of contents; project name and number; condition of samples upon receipt; dates of extraction, preparation, and analysis; discussion of whether or not sample holding times were met; discussion of technical problems or other observations that may have created analytical difficulties; discussion of any laboratory QC checks that failed to meet project criteria; signature of the laboratory Project Manager, and copies of the COC Records

**Chemistry data package** - run log, summary page indicating dates of analyses for samples and laboratory QC checks, cross-referencing of laboratory sample to project sample identification numbers, adequately described data qualifiers, sample preparation and analysis methods, sample results, matrix spike and matrix spike duplicate (MS/MSD) recoveries, laboratory control sample recoveries, method blank results, and surrogate recoveries

Soil sample analytical data generated by the laboratory will be reported in micrograms per kilogram ( $\mu\text{g}/\text{kg}$ ) on a dry-weight basis. Groundwater data will be reported in micrograms per liter ( $\mu\text{g}/\text{L}$ ). Results between the laboratory Method Detection Limit (MDL) and the Quantitation Limit (QL) will be reported. Data retained in the project database may be converted to units other than those reported by the laboratories. Sample results will not be corrected for contamination found in laboratory blanks. However, sample results may be qualified as not detected based on laboratory, field, and/or trip blank contamination.

WATS or subcontractor laboratory (i.e. CAS) will provide the following information in each analytical data package submitted:

Dated cover sheets, signed by the WATS or subcontractor laboratory (i.e. CAS) Laboratory Manager, listing a laboratory batch number; the analyses performed; the number of samples and the respective matrices; the project name and number; narrative comments describing deviations from intended analytical strategy, and problems encountered in analysis; a discussion of any laboratory quality control checks that failed to meet project criteria; and the signature of the laboratory QA Manager.

Tabulated results of inorganic and organic compounds identified and quantified, including sample preparation and analysis dates, and cross-references of laboratory and field sample identification numbers

Analytical results for QC sample spikes, sample duplicates, and blanks; initial and continuing calibration verifications of standards and blanks; standard procedural blanks; laboratory control samples; and the data produced by inductively coupled plasma (ICP) interference check samples, as appropriate for the specified analyses

Tabulation of Method Detection Limits, as appropriate

Raw data system printouts (or legible photocopies) identifying dates of analyses, mass spectra tuning data, name of analyst, parameters determined, initial and continuing calibration, calibration verification summary, method blanks, sample and any dilutions, sample duplicates and spikes, chromatograms, gas chromatograph/mass spectrophotometer (GC/MS) spectra, computer printouts, internal standard area and retention time (RT) summary, cleanup information, control sample results, ICP outputs, and inter-element correction data

### QAPP Worksheet #14 Summary of Project Tasks

<b>Assessment/Audit tasks:</b>	<p>Performance and system audits will be completed in the field and laboratory, as described below and in Worksheets #31 and 32.</p> <p><b>Field audits</b> - The Project Manager will monitor day-to-day field performance through daily communications with the Project Coordinator and on-site field staff and the Construction Manager. In addition, field performance audits and field system audits will be performed, as follows:</p> <p><b>Field performance audits</b> - Field performance audits will be conducted in order to confirm that the activities are being performed according to the established plans. The field performance audit(s) will be performed by the Senior Consultant QA Manager (or her designee), at a frequency that is appropriate for the field activities being performed. The audit(s) will include a discussion of the project progress with the Project Manager and/or the review of field reports, as appropriate. The Senior Consultant QA Manager will record and document any observations made during field system audits, and will discuss the audit and any recommended changes/deviations to the field procedures with the Project Manager.</p> <p><b>Field system audits</b> - Field system audits will be performed by the CRA QA Officer, including a review of rinse and trip blank data to identify potential deficiencies in field sampling and decontamination procedures, and a comparison of the scheduled QA/QC activities described in this QAPP with the QA/QC procedures being performed on the project. Field system audits will be performed at a frequency appropriate for the field activities. The CRA QA Officer will record and document any observations made during field system audits, and will discuss the audit and any recommended changes/deviations to the field procedures with the Project Manager.</p> <p><b>Laboratory audits</b> - Laboratory audits will be performed, as follows:</p> <p><b>Internal audits</b> - The Laboratory QA/QC Manager (or his designee) will conduct internal laboratory audits periodically. This will include an overall evaluation of the performance of laboratory staff and a comparison of laboratory procedures with the laboratory QA Manual and SOPs. Results of the audits will be summarized and distributed to appropriate laboratory staff.</p> <p><b>External audits</b> - The CRA QA Officer will review the laboratory QA Manual and applicable SOPs, and will discuss laboratory procedures with the Laboratory QA/QC Manager prior to the start of project sampling. The CRA QA Officer will record and document any observations made during the review. In addition, as a participant in state and federal certification programs, the laboratory is audited by representatives of the regulatory agency issuing certification. Audits include a review of sample handling and tracking documentation, analytical methodologies, analytical supportive documentation, and final reports. The audit findings are documented and submitted to the laboratory for corrective action, if necessary.</p> <p><b>Corrective action</b> - Corrective actions are required when field or analytical data are not within the objectives specified in this QAPP, as follows:</p>
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**QAPP Worksheet #14  
Summary of Project Tasks**

<p><b>Assessment/Audit tasks:</b> (continued)</p>	<p><b>Field measurement corrective action</b> - Corrective action in the field may be necessary when the sample network is changed (<i>i.e.</i>, more/fewer samples, sampling locations other than those specified in the FSP, etc.), or when sampling procedures and/or field analytical procedures require modification in response to unexpected conditions. Technical staff and project personnel will be responsible for reporting all suspected technical or QA nonconformances or deficiencies of any activity or issued document by reporting the situation to the CRA Project Coordinator or designee. The CRA Project Coordinator will assess the suspected problems in consultation with the CRA Project Manager or CRA QA Officer or designee, and will assist in making a decision based on the potential for the situation to impact the data quality. If it is determined that the situation warrants a reportable nonconformance requiring corrective action, the CRA Field QA Officer will initiate a nonconformance report. If appropriate, the CRA Field QA Officer will ensure that no additional work that is dependent on the nonconforming activity is performed until the corrective actions are completed.</p> <p><b>Laboratory corrective action</b> - Corrective actions are required whenever an out-of-control event or potential out-of-control event is noted. Corrective actions may be necessary if any of the following occur:</p> <ul style="list-style-type: none"> <li>▪ QC data are outside the warning or acceptable windows for precision and accuracy.</li> <li>▪ Blanks contain target analytes above acceptable levels.</li> <li>▪ Undesirable trends are detected in spike recoveries or the RPD between duplicates.</li> <li>▪ There are unusual changes in detection limits.</li> <li>▪ Deficiencies are detected by the Laboratory Manager during internal or external audits or from the results of performance evaluation samples.</li> <li>▪ Inquiries concerning data quality are received.</li> </ul> <p>Corrective actions should be timely, and they should determine the root cause and evaluate any propagation of the error or problem. The investigative action taken is somewhat dependent on the analysis and the event. Corrective action in the laboratory may occur prior to, during, or after the initial analysis. Corrective action is under the supervision of the Laboratory Manager and Laboratory QA Officer. Following a consultation with laboratory scientists, technicians, and team leaders, it may be necessary for the Laboratory Manager to approve the implementation of the corrective action. Some conditions during or after analysis may automatically trigger corrective action or optional procedures. These conditions may include dilution of samples, additional sample extract cleanup, and automatic reinjection/reanalysis when certain quality control criteria are not met, etc. WATS' or subcontractor laboratory's (<i>i.e.</i>, CAS') corrective action procedures are documented in Laboratory SOPs specifying corrective action to be taken when an analytical error is discovered or the analytical system is found to be out of control.</p>
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**QAPP Worksheet #14  
Summary of Project Tasks**

<p><b>Assessment/Audit tasks:</b> (continued)</p>	<p>Depending on the problem, the corrective action employed may be formal or informal. On-the-spot actions are used to correct minor problems, such as recalibration, retuning, or a minor repair (e.g., replacement of a minor part) of a malfunctioning instrument or the correction of poor analytical technique being used. Corrective action procedures may be handled at the bench level by the analyst, who reviews the preparation or extraction procedure that was used for possible errors, and checks the instrument calibration, spike, and calibration mixes, and the instrument sensitivity. These occurrences are documented in the appropriate injection, run, or analysis logbooks. Similarly, routine instrument maintenance, malfunctions, and power failures are also documented in the appropriate instrument maintenance logbooks. If the problem persists or cannot be identified, the matter may be referred to the laboratory team leader, and/or QA/QC Manager for further investigation. Occurrence of the problem, the corrective action employed, and verification that the problem has been eliminated will be properly documented. The corrective action procedure will be discussed with the Laboratory Project Manager, and full documentation of the corrective action procedure, whether resolved or not, will be placed in the laboratory project file. Corrective actions specific to analytical methods are discussed in the operational-specific SOPs.</p> <p>The U.S. EPA RPM or the CRA QA Officer may request corrective action for any nonconformance identified by audits or data validation.</p> <p><b>Corrective action during data validation and data assessment</b> - The need for corrective actions may be identified during data validation or data assessment. Potential types of corrective action may include resampling by the field team or reinjection/reanalysis of samples by the laboratory. Data validation corrective actions may include notification of the laboratory of incomplete or erroneous reports and a request for issuance of corrected versions. When the CRA QA Officer identifies a corrective action situation, the CRA Project Manager will approve the implementation of corrective action, including possible resampling. The CRA QA Officer will notify the laboratory of incomplete or erroneous reports and will request the issuance of corrected versions. All corrective actions will be documented. Final summary data tables will not be issued until all data have been validated and all corrections have been made. Corrective action may include the following:</p> <ul style="list-style-type: none"> <li>▪ Reanalysis of samples, if holding time requirements permit</li> <li>▪ Resampling and analysis</li> <li>▪ Evaluation and amendment of sampling procedures</li> <li>▪ Evaluation and amendment of analytical procedures</li> <li>▪ Acceptance of data and acknowledgment of the level of uncertainty</li> </ul>
<p><b>Data Review tasks:</b></p>	<p>See Worksheets #36 and 37.</p>

**QAPP Worksheet #15-1  
Reference Limits and Evaluation (Surface Water) - WATS**

ANALYTE	CAS NUMBER	PROJECT ACTION LIMIT <sup>(1)</sup>	WATER (µg/L) <sup>(2)</sup>	
			WATS LABORATORY MDL	WATS LABORATORY RL
<b>PCBs (U.S. EPA 608)<sup>(3)</sup></b>				
Aroclor - 1016	12674-11-2	--	0.10	0.2
Aroclor - 1221	11104-28-2	--	--	0.2
Aroclor - 1232	11141-16-5	--	--	0.2
Aroclor - 1242	53469-21-9	--	--	0.2
Aroclor - 1248	12672-29-6	--	--	0.2
Aroclor - 1254	11097-69-1	--	--	0.2
Aroclor - 1260	11096-82-5	--	0.10	0.2
Total PCBs	1336-36-3	0.2 µg/L	--	0.2
<b>Inorganics (Wet Chemistry)<sup>(4)</sup></b>				
TSS (U.S. EPA 160.2)	--	30-45 mg/L	--	5.0 mg/L <sup>(5)</sup>
Total phosphorus as P (U.S. EPA 365.2)	7723-14-0	--	--	0.01 mg/L
Hardness (SM 2340B)-Calculation of Ca & Mg	14797-65-0	--	0.0033 mg/L	1.66 mg/L

Notes:

<sup>(1)</sup> Standards are consistent with the Multi-Area Quality Assurance Project Plan (Rev. 00) For the Kalamazoo River Study Group (Arcadis BBL, 2007b), which are from the MDEQ's Substantive Requirements Document for the Plainwell Dam Superfund Site, dated February 13, 2007. The TSS standards are on a monthly and daily basis, respectively.

<sup>(2)</sup> Concentrations are in µg/L, except where noted.

<sup>(3)</sup> U.S. EPA. *Appendix A to Part 136 Methods for Organic Chemical Analysis of Municipal and Industrial Wastewater Method 608—Organochlorine Pesticides and PCBs*. July 1995.

<sup>(4)</sup> U.S. EPA. *Methods for Chemical Analysis of Water and Wastes*. EPA/600/4-79/020. EMSL-Cincinnati. 1983.

<sup>(5)</sup> The actual Reporting Limit will depend on the volume of sample filtered.

RL = reporting limit.

MDL = Method Detection Limit.

µg/L = micrograms per liter.

mg/L = milligrams per liter.

PCBs = polychlorinated biphenyls.

**QAPP Worksheet #15-2**  
**Reference Limits and Evaluation (Soil/Sediment) - WATS**

PARAMETER <sup>(1)(4)</sup>	CHEMICAL ABSTRACT SERVICE NUMBER	RANGE OF POTENTIALLY APPLICABLE PART 201 CRITERIA <sup>(3)</sup> (µg/kg)			PART 201 TDLs (µg/kg)	WATS QUANTITATION LIMIT <sup>(2)</sup> (µg/kg)	WATS METHOD DETECTION LIMIT <sup>(2)</sup> (µg/kg)
<b>INORGANICS (METALS AND WET CHEMISTRY)</b>							
Aluminum	7429905	1,000	--	1,000,000,000	1,000	500	30
Antimony	7440360	4,300	--	49,000,000	300	50	7
Arsenic	7440382	4,600	--	2,000,000	100	50	3
Barium	7440393	75,000	--	1,000,000,000	1,000	50	2
Beryllium	7440417	51,000	--	1,000,000,000	500	50	2
Cadmium	7440439	1,200	--	230,000,000	200	50	1
Chromium (Total) <sup>(6)</sup>	7440473	3,300	--	140,000,000	2,000	50	3
Cobalt	7440484	800	--	48,000,000	500	50	1
Copper	7440508	32,000	--	1,000,000,000	1,000	50	3
Iron	7439896	6,000	--	1,000,000,000	5,000	500	70
Lead	7439921	21,000	--	100,000,000	1,000	50	1
Magnesium	7439954	8,000,000	--	6,700,000,000	4,000	5,000	20
Manganese	7439965	1,000	--	180,000,000	1,000	50	2
Mercury (total)	7439976	50	--	20,000,000	50	2,000	NA
Nickel	7440020	100,000	--	1,000,000,000	1,000	50	6
Selenium	7782492	400	--	130,000,000	200	50	10
Silver	7440224	100	--	200,000,000	100	50	4
Sodium	17341252	2,500,000	--	1,000,000,000	10,000	5,000	100
Thallium	7440280	2,300	--	15,000,000	500	50	1
Vanadium	7440622	72,000	--	1,000,000,000	1,000	50	20
Zinc	7440666	47,000	--	1,000,000,000	1,000	500	30
Cyanide	57125	200	--	250,000	100	400	NA

**QAPP Worksheet #15-2**  
**Reference Limits and Evaluation (Soil/Sediment) - WATS**

PARAMETER <sup>(1)(4)</sup>	CHEMICAL ABSTRACT SERVICE NUMBER	RANGE OF POTENTIALLY APPLICABLE PART 201 CRITERIA <sup>(3)</sup> (µg/kg)			PART 201 TDLs (µg/kg)	WATS QUANTITATION LIMIT <sup>(2)</sup> (µg/kg)	WATS METHOD DETECTION LIMIT <sup>(2)</sup> (µg/kg)
<b>POLYCHLORINATED BIPHENYLS (PCBs)</b>							
Total PCBs	1336363	240,000	-	7,900,000	330	20	NA <sup>(5)</sup>
Aroclor-1016	12674112	--	Part 201 N/A	--	--	10	NA <sup>(5)</sup>
Aroclor-1221	11104282	--	Part 201 N/A	--	--	20	NA <sup>(5)</sup>
Aroclor-1232	11141165	--	Part 201 N/A	--	--	10	NA <sup>(5)</sup>
Aroclor-1242	53469219	--	Part 201 N/A	--	--	10	NA <sup>(5)</sup>
Aroclor-1248	12672296	--	Part 201 N/A	--	--	10	NA <sup>(5)</sup>
Aroclor-1254	11097691	--	Part 201 N/A	--	--	10	NA <sup>(5)</sup>
Aroclor-1260	11096825	--	Part 201 N/A	--	--	10	NA <sup>(5)</sup>
<b>SEMI VOLATILE ORGANIC COMPOUNDS</b>							
2,4,5-Trichlorophenol	95954	39,000	--	23,000,000,000	330	330	20
2,4,6-Trichlorophenol	88062	330	--	1,300,000,000	330	330	13
2,4-Dichlorophenol	120832	380	--	5,100,000,000	330	330	20
2,4-Dimethylphenol	105679	7,400	--	4,700,000,000	330	330	63
2,4-Dinitrotoluene	121142	430	--	20,000,000	330	330	27
2-Chlorophenol	95578	440	--	19,000,000	330	330	20
2-Methylnaphthalene	91576	57,000	--	37,000,000	330	330	30
2-Methylphenols (J)	1319773	1,400	--	6,700,000,000	330	330	23
2-Nitrophenol	88755	400	--	2,900,000	330	330	20
3,3-Dichlorobenzidine	91941	2,000	--	8,200,000	2,000	330	100
4,6-Dinitro-2-methylphenol (2-methyl-4,6-dinitrophenol)	534521	830	--	360,000	830	330	20
4-Chloro-3-methylphenol	59507	280	--	20,000,000	280	330	20
4-Methylphenol (J)	1319773	1,400	--	6,700,000,000	330	330	23
Acenaphthene	83329	4,400	--	14,000,000,000	330	330	20
Acenaphthylene	208968	5,900	--	2,300,000,000	330	330	17
Anthracene	120127	41,000	--	67,000,000,000	330	330	17

**QAPP Worksheet #15-2**  
**Reference Limits and Evaluation (Soil/Sediment) - WATS**

PARAMETER <sup>(1)(4)</sup>	CHEMICAL ABSTRACT SERVICE NUMBER	RANGE OF POTENTIALLY APPLICABLE PART 201 CRITERIA <sup>(3)</sup> (µg/kg)			PART 201 TDLs (µg/kg)	WATS QUANTITATION LIMIT <sup>(2)</sup> (µg/kg)	WATS METHOD DETECTION LIMIT <sup>(2)</sup> (µg/kg)
Benzo(a)anthracene	56553	20,000	--	160,000	330	330	10
Benzo(a)pyrene	50328	2,000	--	1,900,000	330	330	13
Benzo(b)fluoranthene	205992	20,000	--	160,000	330	330	17
Benzo(g,h,i)perylene	191242	2,500,000	--	800,000,000	330	330	7
Benzo(k)fluoranthene	207089	200,000	--	1,600,000	330	330	20
bis(2-Chloroethyl)ether (I)	111444	100	--	12,000,000	100	330	37
bis(2-Ethylhexyl)phthalate	117817	2,800,000	--	890,000,000	330	330	30
Butyl benzyl phthalate	85687	26,000	--	47,000,000,000	330	330	23
Carbazole	86748	1,100	--	3,400,000	330	330	40
Chrysene	218019	2,000,000	--	16,000,000	330	330	13
Dibenzo(a,h)anthracene	53703	2,000	--	16,000	330	330	7
Dibenzofuran	132649	--	1,700	--	330	330	23
Diethyl phthalate	84662	2,200	--	3,300,000,000	330	330	17
Dimethyl phthalate	131113	790,000	--	3,300,000,000	330	330	17
Di-n-butylphthalate	84742	11,000	--	3,300,000,000	330	330	10
Di-n-octyl phthalate	117840	6,900,000	--	140,000,000	330	330	13
Fluoranthene	206440	5,500	--	9,300,000,000	330	330	27
Fluorene	86737	5,300	--	9,300,000,000	330	330	30
Hexachlorobenzene (C-66)	118741	350	--	8,500,000	330	330	23
Hexachlorobutadiene (C-46)	87683	91	--	180,000,000	50	330	40
Hexachlorocyclopentadiene (C-56)	77474	30,000	--	13,000,000	330	330	330
Hexachloroethane	67721	430	--	230,000,000	300	330	33
Indeno(1,2,3-cd)pyrene	193395	20,000	--	160,000	330	330	7
Isophorone	78591	11,000	--	12,000,000,000	330	330	17
Naphthalene	91203	870	--	200,000,000	330	330	27
Nitrobenzene (I)	98953	330	--	47,000,000	330	330	37
n-Nitroso-di-n-propylamine	621647	330	--	2,000,000	330	330	23

**QAPP Worksheet #15-2**  
**Reference Limits and Evaluation (Soil/Sediment) - WATS**

PARAMETER <sup>(1)(4)</sup>	CHEMICAL ABSTRACT SERVICE NUMBER	RANGE OF POTENTIALLY APPLICABLE PART 201 CRITERIA <sup>(3)</sup> (µg/kg)			PART 201 TDLs (µg/kg)	WATS QUANTITATION LIMIT <sup>(2)</sup> (µg/kg)	WATS METHOD DETECTION LIMIT <sup>(2)</sup> (µg/kg)
N-Nitrosodiphenylamine	86306	5,400	--	11,000,000	330	330	53
Pentachlorophenol	87865	22	--	130,000,000	20	330	30
Phenanthrene	85018	5,300	--	7,200,000	330	330	17
Phenol	108952	4,200	--	40,000,000,000	330	330	23
Pyrene	129000	480,000	--	6,700,000,000	330	330	40

**Notes:**

<sup>(1)</sup> The parameters included in this table are those included in the USEPA Contract Laboratory Program (CLP) Target Compound List (TCL) and Target Analyte List (TAL), except those that are not on the Part 201 list; Calcium, Potassium, 1,2,3-Trichlorobenzene, Bromochloromethane, Cyclohexane, Methyl Acetate, Methylcyclohexane (methyl phenol), 1,1-Biphenyl, 2,2-oxybis(1-Chloropropane), 2,4-Dinitrophenol, 2,6-Dinitrotoluene, 2-Nitroaniline, 3-Nitroaniline, 4-Bromophenyl-phenylether, 4-Chloroaniline, 4-Chlorophenyl-phenylether, 4-Nitroaniline, 4-Nitrophenol, Benzaldehyde, bis(2-Chloroethoxy)methane. Or those that are not typically analyzed by WATS or CAS: 1,1,2-Trichloro-1,2,2-trifluoroethane, 1,2,4,5-Tetrachlorobenzene, Acetophenone, Atrazine, beta-Chloronaphthalene, Caprolactum.

<sup>(2)</sup> The actual Quantitation Limits and Method Detection Limits will vary with sample size, for the analysis of PCBs and PAHs.

<sup>(3)</sup> Potentially applicable Michigan Part 201 Criteria are from the Michigan Department of Environmental Quality (MDEQ) Remediation and Redevelopment Division (RRD) Operational Memorandum No. 1, dated January 23, 2006.

<sup>(4)</sup> VOC analysis will be conducted by Columbia Analytical Services. All other analyses will be conducted by Weyerhaeuser Analytical Testing Services

<sup>(5)</sup> The MDL actually achievable in a given analysis will vary depending on detector response characteristics, irreducible noise from instrument electronics, and matrix effects.

<sup>(6)</sup> The Michigan Part 201 Criteria for Hexavalent Chromium will be used for Chromium (total) as there is no total chromium criteria established.

WATS = Weyerhaeuser Analytical Testing Service.

NA = Not Available

**QAPP Worksheet #15-3**  
**Reference Limits and Evaluation (Groundwater) - WATS**

PARAMETER <sup>(1)</sup>	CHEMICAL ABSTRACT SERVICE NUMBER	RANGE OF POTENTIALLY APPLICABLE PART 201 CRITERIA <sup>(3)</sup> (µG/L)			PART 201 TARGET DETECTION LIMIT (µG/L)	AQUEOUS QUANTITATION LIMIT <sup>(2)</sup> (µG/L)	METHOD DETECTION LIMIT <sup>(2)</sup> (µG/L)
<b>METALS (TOTAL/SPLP) AND CYANIDE</b>							
Aluminum	7429905	50	--	64,000,000	50	5	0.3
Antimony	7440360	6	--	68,000	2	0.5	0.07
Arsenic	7440382	10	--	4,300	5	0.5	0.03
Barium	7440393	2,000	--	14,000,000	100	0.5	0.02
Beryllium	7440417	4	--	290,000	1	0.5	0.02
Cadmium	7440439	5	--	190,000	1	0.5	0.01
Chromium (Total) <sup>(6)</sup>	7440473	11	--	460,000	10	0.5	0.03
Cobalt	7440484	40	--	2,400,000	20	0.5	0.008
Copper	7440508	1,000	--	7,400,000	4	0.5	0.03
Iron	7439896	300	--	58,000,000	200	0.5	0.7
Lead	7439921	--	4	--	3	0.5	0.006
Magnesium	7439954	400,000	--	1,000,000,000	1,000	50	0.2
Manganese	7439965	50	--	9,100,000	50	0.5	0.02
Mercury (total) <sup>(4)</sup>	7439976	0.0013	--	56	0.001	1 (ng/L)	0.06 (ng/L)
Nickel	7440020	100.00	--	74,000,000	20	0.5	0.06
Selenium	7782492	5	--	970,000	5	0.5	0.1
Silver	7440224	0.2	--	1,500,000	0.2	0.5	0.04
Sodium	17341252	120,000	--	1,000,000,000	1,000	50	1
Thallium	7440280	2	--	13,000	2	0.5	0.007
Vanadium	7440622	5	--	970,000	4	0.5	0.2
Zinc	7440666	2,400	--	110,000,000	50	5	0.3
Cyanide	57125	5	--	57,000	5	9	3

**QAPP Worksheet #15-3**  
**Reference Limits and Evaluation (Groundwater) - WATS**

PARAMETER <sup>(1)</sup>	CHEMICAL ABSTRACT SERVICE NUMBER	RANGE OF POTENTIALLY APPLICABLE PART 201 CRITERIA <sup>(3)</sup> (µG/L)			PART 201 TARGET DETECTION LIMIT (µG/L)	AQUEOUS QUANTITATION LIMIT <sup>(2)</sup> (µG/L)	METHOD DETECTION LIMIT <sup>(2)</sup> (µG/L)
<b>POLYCHLORINATED BIPHENYLS (PCBs)</b>							
Total PCBs	1336363	0.2	--	45	0.2	0.2	NA <sup>(5)</sup>
Aroclor-1016	12674112	--	Part 201 N/A	--	--	0.2	NA <sup>(5)</sup>
Aroclor-1221	11104282	--	Part 201 N/A	--	--	0.2	NA <sup>(5)</sup>
Aroclor-1232	11141165	--	Part 201 N/A	--	--	0.2	NA <sup>(5)</sup>
Aroclor-1242	53469219	--	Part 201 N/A	--	--	0.2	NA <sup>(5)</sup>
Aroclor-1248	12672296	--	Part 201 N/A	--	--	0.2	NA <sup>(5)</sup>
Aroclor-1254	11097691	--	Part 201 N/A	--	--	0.2	NA <sup>(5)</sup>
Aroclor-1260	11096825	--	Part 201 N/A	--	--	0.2	NA <sup>(5)</sup>
<b>VOLATILE ORGANIC COMPOUNDS</b>							
1,1,1-Trichloroethane	71556	200	--	1,300,000	1	0.5	0.13
1,1,2,2-Tetrachloroethane	79345	9	--	77,000	1	0.5	0.09
1,1,2-Trichloroethane	79005	5	--	110,000	1	0.5	0.10
1,1-Dichloroethane	75343	740	--	2,400,000	1	0.5	0.09
1,1-Dichloroethylene	75354	7	--	140,000	1	0.5	0.08
1,2,4-Trichlorobenzene	120821	30	--	300,000	5	0.5	0.07
1,2-Dibromoethane (ethylene dibromide)	106934	0.05	--	15,000	0.05	0.5	0.11
1,2-Dichlorobenzene	95501	16	--	160,000	1	0.5	0.06
1,2-Dichloroethane	107062	5	--	2,500,000	1	0.5	0.12
1,2-Dichloropropane	78875	5	--	2,800,000	1	0.5	0.09
1,3-Dichlorobenzene	541731	7	--	2,000	1	0.5	0.09
1,4-Dichlorobenzene	106467	13	--	74,000	1	0.5	0.11
2-Butanone (MEK)	78933	2,200	--	240,000,000	25	5	0.92
2-Hexanone	591786	1,000	--	8,700,000	50	5	0.84
4-Methyl-2-pentanone (MIBK)	108101	1,800	--	20,000,000	50	5	0.77
Acetone	67641	730	--	1,000,000,000	50	5	0.74
Benzene	71432	5	--	68,000	1	0.5	0.10

**QAPP Worksheet #15-3**  
**Reference Limits and Evaluation (Groundwater) - WATS**

PARAMETER <sup>(1)</sup>	CHEMICAL ABSTRACT SERVICE NUMBER	RANGE OF POTENTIALLY APPLICABLE PART 201 CRITERIA <sup>(3)</sup> (µG/L)			PART 201 TARGET DETECTION LIMIT (µG/L)	AQUEOUS QUANTITATION LIMIT <sup>(2)</sup> (µG/L)	METHOD DETECTION LIMIT <sup>(2)</sup> (µG/L)
Bromodichloromethane	75274	80	--	37,000	1	0.5	0.08
Bromoform	75252	80	--	3,100,000	1	0.5	0.09
Bromomethane	74839	10	--	70,000	5	0.5	0.21
Carbon disulfide	75150	800	--	1,200,000	5	0.5	0.09
Carbon tetrachloride	56235	5	--	9,600	1	0.5	0.09
Chlorobenzene	108907	47	--	470,000	1	0.5	0.08
Chloroethane	75003	430	--	5,700,000	5	0.5	0.09
Chloroform	67663	80	--	180,000	1	0.5	0.07
Chloromethane	74873	260	--	490,000	5	0.5	0.15
cis-1,2-Dichloroethylene	156592	70	--	530,000	1	0.5	0.09
cis-1,3-Dichloropropene	542756	8.5	--	130,000	1	0.5	0.16
Dibromochloromethane	124481	80	--	110,000	5	0.5	0.09
Dibromochloropropane	96128	0.2	--	1,200	0.2	0.5	0.26
Dichlorodifluoromethane	75718	1,700	--	300,000	5	0.5	0.12
Ethylbenzene	100414	18	--	170,000	1	0.5	0.10
Isopropyl benzene	98828	800	--	56,000	5	0.5	0.15
Methylene chloride	75092	5	--	1,400,000	5	0.5	0.04
Methyl-tert-butyl ether (MTBE)	1634044	40	--	47,000,000	5	0.5	0.12
Styrene	100425	80	--	310,000	1	0.5	0.07
Tetrachloroethylene	127184	5	--	200,000	1	0.5	0.12
Toluene	108883	140	--	530,000	1	0.5	0.09
trans-1,2-Dichloroethylene	156605	100	--	230,000	1	0.5	0.11
trans-1,3-Dichloropropene	542756	8.5	--	130,000	1	0.5	0.15
Trichloroethylene	79016	5	--	1,100,000	1	0.5	0.10
Trichlorofluoromethane	75694	2,600	--	1,100,000	1	0.5	0.08
Vinyl chloride	75014	2	--	33,000	1	0.5	0.06
m,p-Xylene	1330207	35	--	190,000	3	0.5	0.27

**QAPP Worksheet #15-3**  
**Reference Limits and Evaluation (Groundwater) - WATS**

PARAMETER <sup>(1)</sup>	CHEMICAL ABSTRACT SERVICE NUMBER	RANGE OF POTENTIALLY APPLICABLE PART 201 CRITERIA <sup>(3)</sup> (µG/L)			PART 201 TARGET DETECTION LIMIT (µG/L)	AQUEOUS QUANTITATION LIMIT <sup>(2)</sup> (µG/L)	METHOD DETECTION LIMIT <sup>(2)</sup> (µG/L)
		35	--	190,000			
o-Xylene	1330207	35	--	190,000	3	0.5	0.12
<b>SEMI VOLATILE ORGANIC COMPOUNDS</b>							
2,4,5-Trichlorophenol	95954	730	--	170,000	5	10	0.6
2,4,6-Trichlorophenol	88062	4.4	--	10,000	4	10	0.4
2,4-Dichlorophenol	120832	19	--	48,000	10	10	0.6
2,4-Dimethylphenol	105679	370	--	520,000	5	10	1.9
2,4-Dinitrotoluene	121142	7.7	--	8,600	5	10	0.8
2-Chlorophenol	95578	22	--	94,000	10	10	0.6
2-Methylnaphthalene	91576	260	--	25,000	5	10	0.9
2-Methylphenol (J)	1319773	71	--	810,000	10	10	0.7
2-Nitrophenol	88755	20	--	79,000	5	10	0.6
3,3-Dichlorobenzidine	91941	0.3	--	180	0.3	10	3
4,6-Dinitro-2-methylphenol (2-methyl-4,6-dinitrophenol)	534521	20	--	9,500	20	10	0.6
4-Chloro-3-methylphenol	59507	7.4	--	79,000	5	10	0.6
4-Methylphenol (J)	1319773	71	--	810,000	10	10	0.7
Acenaphthene	83329	19	--	4,200	5	10	0.6
Acenaphthylene	208968	52	--	3,900	5	10	0.5
Anthracene	120127	--	43	--	5	10	0.5
Benzo(a)anthracene	56553	2.1	--	9.4	1	10	0.3
Benzo(a)pyrene	50328	1	--	5	1	10	0.4
Benzo(b)fluoranthene	205992	--	1.5	--	1	10	0.5
Benzo(g,h,i)perylene	191242	--	1	--	1	10	0.2
Benzo(k)fluoranthene	207089	--	1	--	1	10	0.6
bis(2-Chloroethyl)ether (I)	111444	1	--	17,000,000	1	10	1.1
bis(2-Ethylhexyl)phthalate	117817	6	--	340	5	10	0.9
Butyl benzyl phthalate	85687	14	--	2,700	5	10	0.7

**QAPP Worksheet #15-3**  
**Reference Limits and Evaluation (Groundwater) - WATS**

PARAMETER <sup>(1)</sup>	CHEMICAL ABSTRACT SERVICE NUMBER	RANGE OF POTENTIALLY APPLICABLE PART 201 CRITERIA <sup>(3)</sup> (µG/L)			PART 201 TARGET DETECTION LIMIT (µG/L)	AQUEOUS QUANTITATION LIMIT <sup>(2)</sup> (µG/L)	METHOD DETECTION LIMIT <sup>(2)</sup> (µG/L)
Carbazole	86748	10	--	7,400	10	10	1.2
Chrysene	218019		1.6		1	10	0.4
Dibenzo(a,h)anthracene	53703		2		2	10	0.2
Dibenzofuran	132649		4		4	10	0.7
Diethyl phthalate	84662	110	-	1,100,000	5	10	0.5
Dimethyl phthalate	131113	73,000	-	4,200,000	5	10	0.5
Di-n-butylphthalate	84742	9.7	-	11,000	5	10	0.3
Di-n-octyl phthalate	117840	130	-	400	5	10	0.4
Fluoranthene	206440	1.6	-	210	1	10	0.8
Fluorene	86737	12	-	2,000	5	10	0.9
Hexachlorobenzene (C-66)	118741	0.2	-	3,000	0.2	10	0.7
Hexachlorobutadiene (C-46)	87683	0.05	-	3,200	0.05	10	1.2
Hexachlorocyclopentadiene (C-56)	77474	50	-	1,600	5	10	10
Hexachloroethane	67721	6.7	-	50,000	5	10	1
Indeno(1,2,3-cd)pyrene	193395		2		2	10	0.2
Isophorone	78591	570	-	12,000,000	5	10	0.5
Naphthalene	91203	13	-	31,000	5	10	0.8
Nitrobenzene (I)	98953	3.4	-	550,000	3	10	1.1
n-Nitroso-di-n-propylamine	621647	5	-	360	5	10	0.7
N-Nitrosodiphenylamine	86306	270	-	35,000	5	10	1.6
Pentachlorophenol	87865	1	-	200	1	10	0.9
Phenanthrene	85018	2.4	-	1,000	2	10	0.5
Phenol	108952	210	-	29,000,000	5	10	0.7
Pyrene	129000		140		5	10	1.2

**QAPP Worksheet #15-3  
Reference Limits and Evaluation (Groundwater) - WATS**

PARAMETER <sup>(1)</sup>	CHEMICAL ABSTRACT SERVICE NUMBER	RANGE OF POTENTIALLY APPLICABLE PART 201 CRITERIA <sup>(3)</sup> (µG/L)	PART 201 TARGET DETECTION LIMIT (µG/L)	AQUEOUS QUANTITATION LIMIT <sup>(2)</sup> (µG/L)	METHOD DETECTION LIMIT <sup>(2)</sup> (µG/L)
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Notes:

<sup>(1)</sup> The parameters included in this table are those included in the USEPA Contract Laboratory Program (CLP) Target Compound List (TCL) and Target Analyte List (TAL), except those that are not on the Part 201 list Calcium, Potassium, 1,2,3-Trichlorobenzene, Bromochloromethane, Cyclohexane, Methyl Acetate, Methylcyclohexane (methyl phenol), 1,1-Biphenyl, 2,2-oxybis(1-Chloropropane), 2,4-Dinitrophenol, 2,6-Dinitrotoluene, 2-Nitroaniline, 3-Nitroaniline, 4-Bromophenyl-phenylether, 4-Chloroaniline, 4-Chlorophenyl-phenylether, 4-Nitroaniline, 4-Nitrophenol, Benzaldehyde, bis(2-Chloroethoxy)methane. Or those that are not typically analyzed by WATS or CAS: 1,1,2-Trichloro-1,2,2-trifluoroethane, 1,2,4,5-Tetrachlorobenzene, Acetophenone, Atrazine, beta-Chloronaphthalene, Caprolactum.

<sup>(2)</sup> The actual Quantitation Limits and Method Detection Limits will vary with sample size, for the analysis of PCBs and PAHs.

<sup>(3)</sup> Potentially applicable Michigan Part 201 Criteria are from the Michigan Department of Environmental Quality (MDEQ) Remediation and Redevelopment Division (RRD) Operational Memorandum No. 1, dated December 10, 2004.

<sup>(4)</sup> Low level and methyl mercury will be analyzed by Columbia Analytical Services (CAS).

<sup>(5)</sup> The MDL actually achievable in a given analysis will vary depending on detector response characteristics, irreducible noise from instrument electronics, and matrix effects.

<sup>(6)</sup> The Michigan Part 201 Criteria for Hexavalent Chromium will be used for Chromium (total) as there is no total chromium criteria established.

WATS = Weyerhaeuser Analytical Testing Service.

NA = Not Available

**QAPP Worksheet #15-4  
Reference Limits and Evaluation (Surface Water) - CAS**

ANALYTE	CAS NUMBER	PROJECT ACTION LIMIT <sup>(1)</sup>	WATER (µg/L) <sup>(2)</sup>	
			CAS LABORATORY MDL	CAS LABORATORY RL
<b>PCBs (U.S. EPA 608)<sup>(3)</sup></b>				
Aroclor - 1016	12674-11-2	--	0.0041	0.02
Aroclor - 1221	11104-28-2	--	0.0041	0.04
Aroclor - 1232	11141-16-5	--	0.0041	0.02
Aroclor - 1242	53469-21-9	--	0.0041	0.02
Aroclor - 1248	12672-29-6	--	0.0041	0.02
Aroclor - 1254	11097-69-1	--	0.0041	0.02
Aroclor - 1260	11096-82-5	--	0.0041	0.02
Total PCBs	1336-36-3	0.2 µg/L	0.0041	0.04
<b>Metals</b>				
Low Level Mercury	7439-97-6	--	0.08 ng/L	1 ng/L
Methyl Mercury	22967-92-6	--	0.05 ng/L	0.1 ng/L

Notes:

<sup>(1)</sup> Standards are consistent with the Multi-Area Quality Assurance Project Plan (Rev. 00) For the Kalamazoo River Study Group (Arcadis BBL, 2007b), which are from the MDEQ's Substantive Requirements Document for the Plainwell Dam Superfund Site, dated February 13, 2007.

<sup>(2)</sup> Concentrations are in µg/L, except where noted.

<sup>(3)</sup> U.S. EPA. *Appendix A to Part 136 Methods for Organic Chemical Analysis of Municipal and Industrial Wastewater Method 608—Organochlorine Pesticides and PCBs*. July 1995.

<sup>(4)</sup> U.S. EPA. *Methods for Chemical Analysis of Water and Wastes*. EPA/600/4-79/020. EMSL-Cincinnati. 1983.

<sup>(5)</sup> The actual Reporting Limit will depend on the volume of sample filtered.

RL = reporting limit.

MDL = Method Detection Limit.

µg/L = micrograms per liter.

ng/L = nanogramss per liter.

PCBs = polychlorinated biphenyls.

**QAPP Worksheet #15-5**  
**Reference Limits and Evaluation (Soil/Sediment) - CAS**

PARAMETER <sup>(1)</sup>	CHEMICAL ABSTRACT SERVICE NUMBER	RANGE OF POTENTIALLY APPLICABLE PART 201 CRITERIA <sup>(3)</sup> (µg/kg)			PART 201 TDLs (µg/kg)	CAS QUANTITATION LIMIT <sup>(2)</sup> (µg/kg)	CAS METHOD DETECTION LIMIT <sup>(2)</sup> (µg/kg)
<b>INORGANICS (METALS AND WET CHEMISTRY)</b>							
Aluminum	7429905	1,000	--	1,000,000,000	1,000	2000	400
Antimony	7440360	4,300	--	49,000,000	300	50	20
Arsenic	7440382	4,600	--	2,000,000	100	500	60
Barium	7440393	75,000	--	1,000,000,000	1,000	50	5
Beryllium	7440417	51,000	--	1,000,000,000	500	20	3
Cadmium	7440439	1,200	--	230,000,000	200	20	4
Chromium (Total) <sup>(6)</sup>	7440473	3,300	--	140,000,000	2,000	200	30
Cobalt	7440484	800	--	48,000,000	500	20	3
Copper	7440508	32,000	--	1,000,000,000	1,000	100	80
Iron	7439896	6,000	--	1,000,000,000	5,000	4000	700
Lead	7439921	21,000	--	100,000,000	1,000	50	9
Magnesium	7439954	8,000,000	--	6,700,000,000	4,000	4000	300
Manganese	7439965	1,000	--	180,000,000	1,000	50	30
Mercury (total)	7439976	50	--	20,000,000	50	20	2
Nickel	7440020	100,000	--	1,000,000,000	1,000	200	30
Selenium	7782492	400	--	130,000,000	200	1000	200
Silver	7440224	100	--	200,000,000	100	20	8
Sodium	17341252	2,500,000	--	1,000,000,000	10,000	40,000	4,000
Thallium	7440280	2,300	--	15,000,000	500	20	3
Vanadium	7440622	72,000	--	1,000,000,000	1,000	200	20
Zinc	7440666	47,000	--	1,000,000,000	1,000	500	200
Cyanide	57125	200	--	250,000	100	10	3
Ammonia-N (U.S. EPA 350.1)	7664-41-7	10,000,000	--	6,700,000,000	1,000	500	40
Nitrate-N (U.S. EPA 300.0)	14797-55-8	200,000	--	1,000,000,000	--	1000	40
Nitrite-N (U.S. EPA 300.0)	14797-65-0	20,000	--	380,000,000	--	1000	20
Total phosphorus as P (U.S. EPA 365.3)	7723140	1,300,000	--	1,000,000,000	--	100	NA

**QAPP Worksheet #15-5**  
**Reference Limits and Evaluation (Soil/Sediment) - CAS**

PARAMETER <sup>(1)</sup>	CHEMICAL ABSTRACT SERVICE NUMBER	RANGE OF POTENTIALLY APPLICABLE PART 201 CRITERIA <sup>(3)</sup> (µg/kg)			PART 201 TDLs (µg/kg)	CAS QUANTITATION LIMIT <sup>(2)</sup> (µg/kg)	CAS METHOD DETECTION LIMIT <sup>(2)</sup> (µg/kg)
<b>POLYCHLORINATED BIPHENYLS (PCBs)-Low Level</b>							
Total PCBs	1336363	240,000	-	7,900,000	330	20	2.1
Aroclor-1016	12674112	--	Part 201 N/A	--	--	10	2.1
Aroclor-1221	11104282	--	Part 201 N/A	--	--	20	2.1
Aroclor-1232	11141165	--	Part 201 N/A	--	--	10	2.1
Aroclor-1242	53469219	--	Part 201 N/A	--	--	10	2.1
Aroclor-1248	12672296	--	Part 201 N/A	--	--	10	2.1
Aroclor-1254	11097691	--	Part 201 N/A	--	--	10	2.1
Aroclor-1260	11096825	--	Part 201 N/A	--	--	10	2.1
<b>VOLATILE ORGANIC COMPOUNDS – Low/Med</b>							
1,1,1-Trichloroethane	71556	4,000	--	67,000,000,000	50	50.00	11.10
1,1,2,2-Tetrachloroethane	79345	170	--	68,000,000	50	50.00	13.80
1,1,2-Trichloroethane	79005	100	--	190,000,000	50	50.00	10.40
1,1-Dichloroethane	75343	15,000	--	33,000,000,000	50	50.00	9.06
1,1-Dichloroethylene	75354	62	--	62,000,000	50	50.00	19.80
1,2,4-Trichlorobenzene	120821	1,800	--	25,000,000,000	330	200.00	21.80
1,2-Dibromoethane (ethylene dibromide)	106934	20	--	18,000,000	20	200.00	0.73
1,2-Dichlorobenzene	95501	360	--	100,000,000,000	100	50.00	8.47
1,2-Dichloroethane	107062	100	--	150,000,000	50	50.00	11.40
1,2-Dichloropropane	78875	100	--	270,000,000	50	50.00	19.00
1,3-Dichlorobenzene	541731	170	--	170,000	100	50.00	10.20
1,4-Dichlorobenzene	106467	290	--	570,000,000	100	50.00	8.69
2-Butanone (MEK)	78933	44,000	--	67,000,000,000	750	2,000.00	322.00
2-Hexanone	591786	20,000	--	2,700,000,000	2,500	2,000.00	396.00
4-Methyl-2-pentanone (MIBK)	108101	36,000	--	140,000,000,000	2,500	2,000.00	340.00
Acetone	67641	15,000	--	390,000,000,000	1,000	2,000.00	240.00
Benzene	71432	100	--	470,000,000	50	50.00	10.50

**QAPP Worksheet #15-5**  
**Reference Limits and Evaluation (Soil/Sediment) - CAS**

PARAMETER <sup>(1)</sup>	CHEMICAL ABSTRACT SERVICE NUMBER	RANGE OF POTENTIALLY APPLICABLE PART 201 CRITERIA <sup>(3)</sup> (µg/kg)			PART 201 TDLs (µg/kg)	CAS QUANTITATION LIMIT <sup>(2)</sup> (µg/kg)	CAS METHOD DETECTION LIMIT <sup>(2)</sup> (µg/kg)
Bromodichloromethane	75274	1,200	--	110,000,000	100	50.00	8.70
Bromoform	75252	1,600	--	3,600,000,000	100	50.00	27.90
Bromomethane	74839	200	--	330,000,000	200	50.00	21.70
Carbon disulfide	75150	16,000	--	47,000,000,000	250	50.00	15.90
Carbon tetrachloride	56235	100	--	170,000,000	50	50.00	13.00
Chlorobenzene	108907	940	--	4,700,000,000	50	50.00	9.33
Chloroethane	75003	8,600	--	670,000,000,000	250	50.00	17.30
Chloroform	67663	1,600	--	1,600,000,000	50	50.00	9.58
Chloromethane	74873	2,300	--	4,900,000,000	250	50.00	13.60
cis-1,2-Dichloroethylene	156592	1,400	--	2,300,000,000	50	50.00	11.60
cis-1,3-Dichloropropene	542756	170	--	780,000,000	100	50.00	8.90
Dibromochloromethane	124481	1,600	--	160,000,000	100	50.00	8.17
Dibromochloropropane	96128	10	--	13,000,000	10	200.00	99.10
Dichlorodifluoromethane	75718	95,000	--	3,300,000,000,000	250	50.00	16.60
Ethylbenzene	100414	360	--	13,000,000,000	50	50.00	9.74
Isopropyl benzene	98828	91,000	--	5,800,000,000	250	200.00	9.30
Methylene chloride	75092	100	--	8,300,000,000	100	200.00	19.30
Methyl-tert-butyl ether (MTBE)	1634044	800	--	200,000,000,000	250	50.00	15.00
Styrene	100425	2,200	--	6,900,000,000	50	50.00	9.43
Tetrachloroethylene	127184	100	--	6,800,000,000	50	50.00	14.00
Toluene	108883	2,800	--	27,000,000,000	100	50.00	9.75
trans-1,2-Dichloroethylene	156605	2,000	--	4,700,000,000	50	50.00	13.90
trans-1,3-Dichloropropene	542756	170	--	780,000,000	100	50.00	9.10
Trichloroethylene	79016	100	--	2,300,000,000	50	50.00	18.80
Trichlorofluoromethane	75694	52,000	--	3,800,000,000,000	100	50.00	17.00
Vinyl chloride	75014	40	--	890,000,000	40	50.00	21.10
m,p-Xylenes	1330207	700	--	290,000,000,000	150	50.00	18.60

**QAPP Worksheet #15-5**  
**Reference Limits and Evaluation (Soil/Sediment) - CAS**

PARAMETER <sup>(1)</sup>	CHEMICAL ABSTRACT SERVICE NUMBER	RANGE OF POTENTIALLY APPLICABLE PART 201 CRITERIA <sup>(3)</sup> (µg/kg)			PART 201 TDLs (µg/kg)	CAS QUANTITATION LIMIT <sup>(2)</sup> (µg/kg)	CAS METHOD DETECTION LIMIT <sup>(2)</sup> (µg/kg)
o-Xylenes	1330207	700	--	290,000,000,000	150	50.00	7.85
<b>SEMI VOLATILE ORGANIC COMPOUNDS</b>							
2,4,5-Trichlorophenol	95954	39,000	--	23,000,000,000	330	10	1.5
2,4,6-Trichlorophenol	88062	330	--	1,300,000,000	330	10	1.4
2,4-Dichlorophenol	120832	380	--	5,100,000,000	330	10	1.0
2,4-Dimethylphenol	105679	7,400	--	4,700,000,000	330	50	5.5
2,4-Dinitrotoluene	121142	430	--	20,000,000	330	200	1.7
2-Chlorophenol	95578	440	--	19,000,000	330	10	2.0
2-Methylnaphthalene	91576	57,000	--	37,000,000	330	10	2.2
2-Methylphenols (J)	1319773	1,400	--	6,700,000,000	330	10	1.5
2-Nitrophenol	88755	400	--	2,900,000	330	10	1.5
3,3-Dichlorobenzidine	91941	2,000	--	8,200,000	2,000	100	3.7
4,6-Dinitro-2-methylphenol (2-methyl-4,6-dinitrophenol)	534521	830	--	360,000	830	100	1.4
4-Chloro-3-methylphenol	59507	280	--	20,000,000	280	10	1.4
4-Methylphenol (J)	1319773	1,400	--	6,700,000,000	330	10	1.5
Acenaphthene	83329	4,400	--	14,000,000,000	330	10	1.4
Acenaphthylene	208968	5,900	--	2,300,000,000	330	10	1.2
Anthracene	120127	41,000	--	67,000,000,000	330	10	1.6
Benzo(a)anthracene	56553	20,000	--	160,000	330	10	1.7
Benzo(a)pyrene	50328	2,000	--	1,900,000	330	10	1.7
Benzo(b)fluoranthene	205992	20,000	--	160,000	330	10	1.2
Benzo(g,h,i)perylene	191242	2,500,000	--	800,000,000	330	10	1.5
Benzo(k)fluoranthene	207089	200,000	--	1,600,000	330	10	1.4
bis(2-Chloroethyl)ether (I)	111444	100	--	12,000,000	100	10	1.9
bis(2-Ethylhexyl)phthalate	117817	2,800,000	--	890,000,000	330	100	7.0
Butyl benzyl phthalate	85687	26,000	--	47,000,000,000	330	10	3.2

**QAPP Worksheet #15-5**  
**Reference Limits and Evaluation (Soil/Sediment) - CAS**

PARAMETER <sup>(1)</sup>	CHEMICAL ABSTRACT SERVICE NUMBER	RANGE OF POTENTIALLY APPLICABLE PART 201 CRITERIA <sup>(3)</sup> (µg/kg)			PART 201 TDLs (µg/kg)	CAS QUANTITATION LIMIT <sup>(2)</sup> (µg/kg)	CAS METHOD DETECTION LIMIT <sup>(2)</sup> (µg/kg)
Carbazole	86748	1,100	--	3,400,000	330	10	1.3
Chrysene	218019	2,000,000	--	16,000,000	330	10	1.5
Dibenzo(a,h)anthracene	53703	2,000	--	16,000	330	10	1.5
Dibenzofuran	132649	--	1,700	--	330	10	1.2
Diethyl phthalate	84662	2,200	--	3,300,000,000	330	10	1.3
Dimethyl phthalate	131113	790,000	--	3,300,000,000	330	10	1.0
Di-n-butylphthalate	84742	11,000	--	3,300,000,000	330	20	7.9
Di-n-octyl phthalate	117840	6,900,000	--	140,000,000	330	10	1.7
Fluoranthene	206440	5,500	--	9,300,000,000	330	10	1.6
Fluorene	86737	5,300	--	9,300,000,000	330	10	1.1
Hexachlorobenzene (C-66)	118741	350	--	8,500,000	330	10	1.2
Hexachlorobutadiene (C-46)	87683	91	--	180,000,000	50	10	2.5
Hexachlorocyclopentadiene (C-56)	77474	30,000	--	13,000,000	330	50	29
Hexachloroethane	67721	430	--	230,000,000	300	10	3.1
Indeno(1,2,3-cd)pyrene	193395	20,000	--	160,000	330	10	1.5
Isophorone	78591	11,000	--	12,000,000,000	330	10	1.0
Naphthalene	91203	870	--	200,000,000	330	10	2.3
Nitrobenzene (I)	98953	330	--	47,000,000	330	10	2.2
n-Nitroso-di-n-propylamine	621647	330	--	2,000,000	330	10	2.4
N-Nitrosodiphenylamine	86306	5,400	--	11,000,000	330	10	1.6
Pentachlorophenol	87865	22	--	130,000,000	20	100	20
Phenanthrene	85018	5,300	--	7,200,000	330	10	1.4
Phenol	108952	4,200	--	40,000,000,000	330	30	2.0
Pyrene	129000	480,000	--	6,700,000,000	330	10	1.5

**QAPP Worksheet #15-5  
Reference Limits and Evaluation (Soil/Sediment) - CAS**

PARAMETER <sup>(1)</sup>	CHEMICAL ABSTRACT SERVICE NUMBER	RANGE OF POTENTIALLY APPLICABLE PART 201 CRITERIA <sup>(3)</sup> (µg/kg)	PART 201 TDLs (µg/kg)	CAS QUANTITATION LIMIT <sup>(2)</sup> (µg/kg)	CAS METHOD DETECTION LIMIT <sup>(2)</sup> (µg/kg)
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Notes:

<sup>(1)</sup> The parameters included in this table are those included in the USEPA Contract Laboratory Program (CLP) Target Compound List (TCL) and Target Analyte List (TAL), except those that are not on the Part 201 list: Calcium, Potassium, 1,2,3-Trichlorobenzene, Bromochloromethane, Cyclohexane, Methyl Acetate, Methylcyclohexane (methyl phenol), 1,1-Biphenyl, 2,2-oxybis(1-Chloropropane), 2,4-Dinitrophenol, 2,6-Dinitrotoluene, 2-Nitroaniline, 3-Nitroaniline, 4-Bromophenyl-phenylether, 4-Chloroaniline, 4-Chlorophenyl-phenylether, 4-Nitroaniline, 4-Nitrophenol, Benzaldehyde, bis(2-Chloroethoxy)methane. Or those that are not typically analyzed by WATS or CAS: 1,1,2-Trichloro-1,2,2-trifluoroethane, 1,2,4,5-Tetrachlorobenzene, Acetophenone, Atrazine, beta-Chloronaphthalene, Caprolactum.

<sup>(2)</sup> The actual Quantitation Limits and Method Detection Limits will vary with sample size, for the analysis of PCBs and PAHs.

<sup>(3)</sup> Potentially applicable Michigan Part 201 Criteria are from the Michigan Department of Environmental Quality (MDEQ) Remediation and Redevelopment Division (RRD) Operational Memorandum No. 1, dated January 23, 2006.

<sup>(5)</sup> The MDL actually achievable in a given analysis will vary depending on detector response characteristics, irreducible noise from instrument electronics, and matrix effects.

<sup>(6)</sup> The Michigan Part 201 Criteria for Hexavalent Chromium will be used for Chromium (total) as there is no total chromium criteria established.

CAS = Columbia Analytical Services.

NA = Not Available

**QAPP Worksheet #15-6**  
**Reference Limits and Evaluation (Groundwater) - CAS**

PARAMETER <sup>(1)</sup>	CHEMICAL ABSTRACT SERVICE NUMBER	RANGE OF POTENTIALLY APPLICABLE PART 201 CRITERIA <sup>(3)</sup> (µG/L)			PART 201 TARGET DETECTION LIMIT (µG/L)	CAS AQUEOUS QUANTITATION LIMIT <sup>(2)</sup> (µG/L)	CAS METHOD DETECTION LIMIT <sup>(2)</sup> (µG/L)
<b>METALS (TOTAL/SPLP) AND CYANIDE</b>							
Aluminum	7429905	50	--	64,000,000	50	2	0.3
Antimony	7440360	6	--	68,000	2	0.05	0.02
Arsenic	7440382	10	--	4,300	5	0.5	0.1
Barium	7440393	2,000	--	14,000,000	100	0.05	0.02
Beryllium	7440417	4	--	290,000	1	0.02	0.006
Cadmium	7440439	5	--	190,000	1	0.02	0.005
Chromium (Total) <sup>(6)</sup>	7440473	11	--	460,000	10	0.2	0.04
Cobalt	7440484	40	--	2,400,000	20	0.02	0.006
Copper	7440508	1,000	--	7,400,000	4	0.1	0.02
Iron	7439896	300	--	58,000,000	200	20	3.0
Lead	7439921	--	4	--	3	0.02	0.005
Magnesium	7439954	400,000	--	1,000,000,000	1,000	20	2.0
Manganese	7439965	50	--	9,100,000	50	0.05	0.006
Mercury (total)	7439976		--			0.2	0.02
Low Level Mercury (total) <sup>(4)</sup>	7439976	0.0013	--	56	0.001	1 (ng/L)	0.06 (ng/L)
Methyl Mercury <sup>(4)</sup>	22967926	0.0013	--	56	0.001	0.1 (ng/L)	0.05 (ng/L)
Nickel	7440020	100.00	--	74,000,000	20	0.2	0.03
Selenium	7782492	5	--	970,000	5	1	0.3
Silver	7440224	0.2	--	1,500,000	0.2	0.02	0.004
Sodium	17341252	120,000	--	1,000,000,000	1,000	200	70
Thallium	7440280	2	--	13,000	2	0.02	0.005
Vanadium	7440622	5	--	970,000	4	0.2	0.03
Zinc	7440666	2,400	--	110,000,000	50	0.5	0.2
Cyanide	57125	5	--	57,000	5	10	3.0

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**Reference Limits and Evaluation (Groundwater) - CAS**

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<b>POLYCHLORINATED BIPHENYLS (PCBs)</b>							
Total PCBs	1336363	0.2	--	45	0.2	0.04	0.0041
Aroclor-1016	12674112	--	Part 201 N/A	--	--	0.02	0.0041
Aroclor-1221	11104282	--	Part 201 N/A	--	--	0.04	0.0041
Aroclor-1232	11141165	--	Part 201 N/A	--	--	0.02	0.0041
Aroclor-1242	53469219	--	Part 201 N/A	--	--	0.02	0.0041
Aroclor-1248	12672296	--	Part 201 N/A	--	--	0.02	0.0041
Aroclor-1254	11097691	--	Part 201 N/A	--	--	0.02	0.0041
Aroclor-1260	11096825	--	Part 201 N/A	--	--	0.02	0.0041
<b>VOLATILE ORGANIC COMPOUNDS</b>							
1,1,1-Trichloroethane	71556	200	--	1,300,000	1	0.5	0.050
1,1,2,2-Tetrachloroethane	79345	9	--	77,000	1	0.5	0.064
1,1,2-Trichloroethane	79005	5	--	110,000	1	0.5	0.061
1,1-Dichloroethane	75343	740	--	2,400,000	1	0.5	0.042
1,1-Dichloroethylene	75354	7	--	140,000	1	0.5	0.10
1,2,4-Trichlorobenzene	120821	30	--	300,000	5	2	0.13
1,2-Dibromoethane (ethylene dibromide)	106934	0.05	--	15,000	0.05	2	0.084
1,2-Dichlorobenzene	95501	16	--	160,000	1	0.5	0.044
1,2-Dichloroethane	107062	5	--	2,500,000	1	0.5	0.073
1,2-Dichloropropane	78875	5	--	2,800,000	1	0.5	0.042
1,3-Dichlorobenzene	541731	7	--	2,000	1	0.5	0.041
1,4-Dichlorobenzene	106467	13	--	74,000	1	0.5	0.054
2-Butanone (MEK)	78933	2,200	--	240,000,000	25	20	3.8
2-Hexanone	591786	1,000	--	8,700,000	50	20	2.9
4-Methyl-2-pentanone (MIBK)	108101	1,800	--	20,000,000	50	20	3.0
Acetone	67641	730	--	1,000,000,000	50	20	2.5
Benzene	71432	5	--	68,000	1	0.5	0.045

**QAPP Worksheet #15-6**  
**Reference Limits and Evaluation (Groundwater) - CAS**

PARAMETER <sup>(1)</sup>	CHEMICAL ABSTRACT SERVICE NUMBER	RANGE OF POTENTIALLY APPLICABLE PART 201 CRITERIA <sup>(3)</sup> (µG/L)			PART 201 TARGET DETECTION LIMIT (µG/L)	CAS AQUEOUS QUANTITATION LIMIT <sup>(2)</sup> (µG/L)	CAS METHOD DETECTION LIMIT <sup>(2)</sup> (µG/L)
Bromodichloromethane	75274	80	--	37,000	1	0.5	0.036
Bromoform	75252	80	--	3,100,000	1	0.5	0.080
Bromomethane	74839	10	--	70,000	5	0.5	0.072
Carbon disulfide	75150	800	--	1,200,000	5	0.5	0.045
Carbon tetrachloride	56235	5	--	9,600	1	0.5	0.068
Chlorobenzene	108907	47	--	470,000	1	0.5	0.045
Chloroethane	75003	430	--	5,700,000	5	0.5	0.13
Chloroform	67663	80	--	180,000	1	0.5	0.042
Chloromethane	74873	260	--	490,000	5	0.5	0.053
cis-1,2-Dichloroethylene	156592	70	--	530,000	1	0.5	0.045
cis-1,3-Dichloropropene	542756	8.5	--	130,000	1	0.5	0.038
Dibromochloromethane	124481	80	--	110,000	5	0.5	0.057
Dibromochloropropane	96128	0.2	--	1,200	0.2	2	0.22
Dichlorodifluoromethane	75718	1,700	--	300,000	5	0.5	0.083
Ethylbenzene	100414	18	--	170,000	1	0.5	0.042
Isopropyl benzene	98828	800	--	56,000	5	2	0.031
Methylene chloride	75092	5	--	1,400,000	5	2	0.23
Methyl-tert-butyl ether (MTBE)	1634044	40	--	47,000,000	5	0.5	0.070
Styrene	100425	80	--	310,000	1	0.5	0.039
Tetrachloroethylene	127184	5	--	200,000	1	0.5	0.077
Toluene	108883	140	--	530,000	1	0.5	0.048
trans-1,2-Dichloroethylene	156605	100	--	230,000	1	0.5	0.048
trans-1,3-Dichloropropene	542756	8.5	--	130,000	1	0.5	0.041
Trichloroethylene	79016	5	--	1,100,000	1	0.5	0.061
Trichlorofluoromethane	75694	2,600	--	1,100,000	1	0.5	0.086
Vinyl chloride	75014	2	--	33,000	1	0.5	0.071
m,p-Xylene	1330207	35	--	190,000	3	0.5	0.078

**QAPP Worksheet #15-6**  
**Reference Limits and Evaluation (Groundwater) - CAS**

PARAMETER <sup>(1)</sup>	CHEMICAL ABSTRACT SERVICE NUMBER	RANGE OF POTENTIALLY APPLICABLE PART 201 CRITERIA <sup>(3)</sup> (µG/L)			PART 201 TARGET DETECTION LIMIT (µG/L)	CAS AQUEOUS QUANTITATION LIMIT <sup>(2)</sup> (µG/L)	CAS METHOD DETECTION LIMIT <sup>(2)</sup> (µG/L)
		35	--	190,000			
o-Xylene	1330207	35	--	190,000	3	0.5	0.037
<b>SEMI VOLATILE ORGANIC COMPOUNDS</b>							
2,4,5-Trichlorophenol	95954	730	--	170,000	5	10	0.381
2,4,6-Trichlorophenol	88062	4.4	--	10,000	4	10	0.203
2,4-Dichlorophenol	120832	19	--	48,000	10	10	0.297
2,4-Dimethylphenol	105679	370	--	520,000	5	10	0.264
2,4-Dinitrotoluene	121142	7.7	--	8,600	5	10	0.274
2-Chlorophenol	95578	22	--	94,000	10	10	0.311
2-Methylnaphthalene	91576	260	--	25,000	5	10	0.239
2-Methylphenol (J)	1319773	71	--	810,000	10	10	0.328
2-Nitrophenol	88755	20	--	79,000	5	10	0.373
3,3-Dichlorobenzidine	91941	0.3	--	180	0.3	25	0.27
4,6-Dinitro-2-methylphenol (2-methyl-4,6-dinitrophenol)	534521	20	--	9,500	20	10	2.12
4-Chloro-3-methylphenol	59507	7.4	--	79,000	5	10	0.49
4-Methylphenol (J)	1319773	71	--	810,000	10	10	0.478
Acenaphthene	83329	19	--	4,200	5	10	0.281
Acenaphthylene	208968	52	--	3,900	5	10	0.236
Anthracene	120127	--	43	--	5	10	0.612
Benzo(a)anthracene	56553	2.1	--	9.4	1	10	0.591
Benzo(a)pyrene	50328	1	--	5	1	10	0.651
Benzo(b)fluoranthene	205992	--	1.5	--	1	10	0.584
Benzo(g,h,i)perylene	191242	--	1	--	1	10	0.812
Benzo(k)fluoranthene	207089	--	1	--	1	10	0.827
bis(2-Chloroethyl)ether (I)	111444	1	--	17,000,000	1	10	0.333
bis(2-Ethylhexyl)phthalate	117817	6	--	340	5	10	1.89
Butyl benzyl phthalate	85687	14	--	2,700	5	10	0.47

**QAPP Worksheet #15-6**  
**Reference Limits and Evaluation (Groundwater) - CAS**

PARAMETER <sup>(1)</sup>	CHEMICAL ABSTRACT SERVICE NUMBER	RANGE OF POTENTIALLY APPLICABLE PART 201 CRITERIA <sup>(3)</sup> (µG/L)			PART 201 TARGET DETECTION LIMIT (µG/L)	CAS AQUEOUS QUANTITATION LIMIT <sup>(2)</sup> (µG/L)	CAS METHOD DETECTION LIMIT <sup>(2)</sup> (µG/L)
Carbazole	86748	10	--	7,400	10	10	0.364
Chrysene	218019		1.6		1	10	0.787
Dibenzo(a,h)anthracene	53703		2		2	10	0.752
Dibenzofuran	132649		4		4	10	0.325
Diethyl phthalate	84662	110	-	1,100,000	5	10	0.289
Dimethyl phthalate	131113	73,000	-	4,200,000	5	10	0.254
Di-n-butylphthalate	84742	9.7	-	11,000	5	10	0.652
Di-n-octyl phthalate	117840	130	-	400	5	10	0.626
Fluoranthene	206440	1.6	-	210	1	10	0.652
Fluorene	86737	12	-	2,000	5	10	0.323
Hexachlorobenzene (C-66)	118741	0.2	-	3,000	0.2	10	0.628
Hexachlorobutadiene (C-46)	87683	0.05	-	3,200	0.05	10	0.291
Hexachlorocyclopentadiene (C-56)	77474	50	-	1,600	5	10	1.21
Hexachloroethane	67721	6.7	-	50,000	5	10	0.289
Indeno(1,2,3-cd)pyrene	193395		2		2	10	0.684
Isophorone	78591	570	-	12,000,000	5	10	0.246
Naphthalene	91203	13	-	31,000	5	10	0.365
Nitrobenzene (I)	98953	3.4	-	550,000	3	10	0.567
n-Nitroso-di-n-propylamine	621647	5	-	360	5	10	0.496
N-Nitrosodiphenylamine	86306	270	-	35,000	5	10	0.48
Pentachlorophenol	87865	1	-	200	1	25	2.44
Phenanthrene	85018	2.4	-	1,000	2	10	0.482
Phenol	108952	210	-	29,000,000	5	10	0.324
Pyrene	129000		140		5	10	0.731

**QAPP Worksheet #15-6  
Reference Limits and Evaluation (Groundwater) - CAS**

PARAMETER <sup>(1)</sup>	CHEMICAL ABSTRACT SERVICE NUMBER	RANGE OF POTENTIALLY APPLICABLE PART 201 CRITERIA <sup>(3)</sup> (µG/L)	PART 201 TARGET DETECTION LIMIT (µG/L)	CAS AQUEOUS QUANTITATION LIMIT <sup>(2)</sup> (µG/L)	CAS METHOD DETECTION LIMIT <sup>(2)</sup> (µG/L)
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Notes:

<sup>(1)</sup> The parameters included in this table are those included in the USEPA Contract Laboratory Program (CLP) Target Compound List (TCL) and Target Analyte List (TAL), except those that are not on the Part 201 list Calcium, Potassium, 1,2,3-Trichlorobenzene, Bromochloromethane, Cyclohexane, Methyl Acetate, Methylcyclohexane (methyl phenol), 1,1-Biphenyl, 2,2-oxybis(1-Chloropropane), 2,4-Dinitrophenol, 2,6-Dinitrotoluene, 2-Nitroaniline, 3-Nitroaniline, 4-Bromophenyl-phenylether, 4-Chloroaniline, 4-Chlorophenyl-phenylether, 4-Nitroaniline, 4-Nitrophenol, Benzaldehyde, bis(2-Chloroethoxy)methane. Or those that are not typically analyzed by WATS or CAS: 1,1,2-Trichloro-1,2,2-trifluoroethane, 1,2,4,5-Tetrachlorobenzene, Acetophenone, Atrazine, beta-Chloronaphthalene, Caprolactum.

<sup>(2)</sup> The actual Quantitation Limits and Method Detection Limits will vary with sample size, for the analysis of PCBs and PAHs.

<sup>(3)</sup> Potentially applicable Michigan Part 201 Criteria are from the Michigan Department of Environmental Quality (MDEQ) Remediation and Redevelopment Division (RRD) Operational Memorandum No. 1, dated December 10, 2004.

<sup>(4)</sup> Low level and methyl mercury will be analyzed by Columbia Analytical Services (CAS).

<sup>(5)</sup> The MDL actually achievable in a given analysis will vary depending on detector response characteristics, irreducible noise from instrument electronics, and matrix effects.

<sup>(6)</sup> The Michigan Part 201 Criteria for Hexavalent Chromium will be used for Chromium (total) as there is no total chromium criteria established.

CAS = Columbia Analytical Services.

NA = Not Available

**QAPP Worksheet #15-7  
Reference Limits and Evaluation (Free Product) - CAS**

ANALYTE	CAS NUMBER	PROJECT ACTION LIMIT <sup>(1)</sup>	FREE PRODUCT (mg/kg) <sup>(2)</sup>	
			CAS LABORATORY MDL	CAS LABORATORY RL
<b>PCBs (U.S. EPA 8082)</b>				
Aroclor - 1016	12674-11-2	--	--	1.0
Aroclor - 1221	11104-28-2	--	--	2.0
Aroclor - 1232	11141-16-5	--	--	1.0
Aroclor - 1242	53469-21-9	--	--	1.0
Aroclor - 1248	12672-29-6	--	--	1.0
Aroclor - 1254	11097-69-1	--	--	1.0
Aroclor - 1260	11096-82-5	--	--	1.0
Total PCBs	1336-36-3	--	--	2.0
<b>Physical Properties</b>				
Specific Gravity (ASTM D854-83)	--	--	--	--

Notes:

<sup>(1)</sup> Standards are consistent with the Multi-Area Quality Assurance Project Plan (Rev. 00) For the Kalamazoo River Study Group (Arcadis BBL, 2007b), which are from the MDEQ's Substantive Requirements Document for the Plainwell Dam Superfund Site, dated February 13, 2007. The TSS standards are on a monthly and daily basis, respectively.

<sup>(2)</sup> Concentrations are in µg/L, except where noted.

<sup>(3)</sup> U.S. EPA. *Appendix A to Part 136 Methods for Organic Chemical Analysis of Municipal and Industrial Wastewater Method 608—Organochlorine Pesticides and PCBs*. July 1995.

<sup>(4)</sup> U.S. EPA. *Methods for Chemical Analysis of Water and Wastes*. EPA/600/4-79/020. EMSL-Cincinnati. 1983.

<sup>(5)</sup> The actual Reporting Limit will depend on the volume of sample filtered.

RL = reporting limit.

MDL = Method Detection Limit.

µg/kg – micrograms per kilogram

PCBs = polychlorinated biphenyls.

**QAPP Worksheet #19  
Analytical SOP Requirements**

MATRIX	ANALYTICAL GROUP	CONCENTRATION LEVEL	ANALYTICAL AND PREPARATION METHOD/SOP REFERENCE <sup>(1)</sup>	SAMPLE VOLUME	CONTAINERS (number, size, and type)	PRESERVATION REQUIREMENTS (chemical, temperature, light protected)	MAXIMUM HOLDING TIME (preparation/analysis)
Water	PCBs	All	W-1 (AM E-608) C-13 (SOC 8082Ar)	2 liters	Two 1-liter amber glass bottles with Teflon <sup>®</sup> -lined lid	Cool to 4°C ±2°	14 days to extraction; 40 days to analysis
Water	TSS	All	W-2, W-5 (AM E-160.2) (AQ-O-DLYCHK)	1 liter	One 1-liter plastic container	Cool to 4°C ±2°	7 days to analysis
Water	Total phosphorus	All	W-3 (AM E-365.3)	500 mL	One 500-mL plastic container	H <sub>2</sub> SO <sub>4</sub> to pH<2; cool to 4°C	28 days to analysis
Water	TAL metals (total)	All	W-14 (AM E-200.8M) C-18 (MET-ICPMS) C-31 (MET-ICP) C-33 (MET-7470A)	500 mL	1 x 1,000-mL high-density polyethylene bottle	Cool to 4°C, add nitric acid to pH <2	6 months
Water	Total cyanide and amenable cyanide	All	W-25 (AM E-335.2 CLP-M) C-19 (GEN-CN)	500 ml	1 x 500 ml plastic bottle	Sodium Hydroxide to pH ≤ 12; Cool to 4°C	14 days
Water	Low-level mercury (total)	All	C-4 (MET-1631)	500 mL	1 x 500-mL fluorinated LPE bottle	Add HCl to pH <2, 2.5 mL of BrCl is added at laboratory	48 hrs unpreserved; 90 days preserved to analysis.
Water	Methyl Mercury	All	C-7 (MET-1630W)	500 mL	1 x 500 mL fluorinated plastic bottle	Dark, Cool to 4°C, add HCl to pH <2, in clean polyethylene bag	180 days to analysis

**QAPP Worksheet #19  
Analytical SOP Requirements**

MATRIX	ANALYTICAL GROUP	CONCENTRATION LEVEL	ANALYTICAL AND PREPARATION METHOD/SOP REFERENCE <sup>(1)</sup>	SAMPLE VOLUME	CONTAINERS (number, size, and type)	PRESERVATION REQUIREMENTS (chemical, temperature, light protected)	MAXIMUM HOLDING TIME (preparation/analysis)
Water	SVOCs	All	W-15 (AM E-8270) C-20 (SOC 8270C)	1,000 mL	2 x 1,000-mL amber glass bottle, Teflon <sup>®</sup> -lined cap	Cool to 4°C; protect from light	Extract within 7 days; analyze within 40 days of extraction
Water	VOCs	All	W-21 (AM E-8260) C-5, C-6 (VOC-8260)	1 x 40 mL VOA vial	3 x 40-mL glass VOA vials with Teflon <sup>®</sup> septum	Cool to 4°C, add HCl to pH <2; protect from light	14 days (sample should remain on-site less than 24 hours)
Water	Hardness	All	W-26 (AM S-2340B)	500 mL	1 x 1,000-mL high-density polyethylene bottle	Cool to 4°C, add nitric acid to pH <2	6 months
Soil/Sediment	PCBs	All	W-4 (AM-E-8082) C-13 (SOC-8082Ar)	200 grams	One 8-oz glass jar with Teflon <sup>®</sup> -lined lid	Cool to 4°C ±2°	14 days to extraction; 40 days to analysis
Soil	Metals	All	W-14 (AM E-200.8M) C-18 (MET-ICPMS) C-31 (MET-ICP) C-32 (MET-7471AB)	50 grams	One 500-mL amber glass bottle with Teflon <sup>®</sup> -lined lid	Cool to 4°C ±2°	6 months
Soil	Cyanide	All	W-25 (AM E-335.2 CLP-M) C-19 (GEN-CN)	10 grams (at least)	One 8-oz wide mouth glass jar	Cool to 4°C ±2°	14 days

**QAPP Worksheet #19  
Analytical SOP Requirements**

MATRIX	ANALYTICAL GROUP	CONCENTRATION LEVEL	ANALYTICAL AND PREPARATION METHOD/SOP REFERENCE <sup>(1)</sup>	SAMPLE VOLUME	CONTAINERS (number, size, and type)	PRESERVATION REQUIREMENTS (chemical, temperature, light protected)	MAXIMUM HOLDING TIME (preparation/analysis)
Soil	SVOCs	All	W-15 (AM E-8270) C-20 (SOC 8270C)	100 grams	One 500-mL amber glass bottle with Teflon <sup>®</sup> -lined lid	Cool to 4°C ±2°	14 days
Soil	VOCs	All	C-5, C-6 (VOC-8260, VOC-5035)	5 grams	1x40-mL VOA vials	Vial containing 5 ml Methanol, cool to 4°C ±2°	14 days
Soil	GRO, DRO	All	W-22, W-23 (AM U-WTPH-D, AM U-WTPH-G) C-22, C-23 (PET-GRO, PET-SVF)	100 grams	WTPH-D- One 500-mL amber glass bottle with Teflon <sup>®</sup> -lined lid. WTPH-G-4 oz jar with Teflon <sup>®</sup> -lined lid	Cool to 4°C ±2°	14 days
Soil	Ammonia-N	All	C-9 (GEN-350.1)	100 grams	One 500-mL amber glass bottle with Teflon <sup>®</sup> -lined lid	Cool to 4°C ±2	7 days to extraction; 28 days to analysis (preserved with 9N sulfuric acid)
Soil	Nitrate-N	All	C-8 (GEN-353.2)	50 grams	One 8-oz wide mouth glass jar	Cool to 4°C ±2°	7 days to extraction; 28 days to analysis
Soil	Nitrite-N	All	C-8 (GEN-353.2)	50 grams	One 8-oz wide mouth glass jar	Cool to 4°C ±2°	7 days to extraction; 48 hours to analysis
Soil	Phosphorous-Total	All	C-10 (GEN-365.3)	50 grams	One 8-oz wide mouth glass jar	Cool to 4°C ±2°	28 days
Free product	PCBs	All	C-13, C-14 (SOC-8082Ar) (EXT-3580)	3L	3 x 1L Glass	None	14 days to extraction; 40 days to analysis

**QAPP Worksheet #19**  
**Analytical SOP Requirements**

<b>MATRIX</b>	<b>ANALYTICAL GROUP</b>	<b>CONCENTRATION LEVEL</b>	<b>ANALYTICAL AND PREPARATION METHOD/SOP REFERENCE<sup>(1)</sup></b>	<b>SAMPLE VOLUME</b>	<b>CONTAINERS (number, size, and type)</b>	<b>PRESERVATION REQUIREMENTS (chemical, temperature, light protected)</b>	<b>MAXIMUM HOLDING TIME (preparation/analysis)</b>
Free Product	Specific Gravity	Not Applicable	C-16 (GEN-SPECGRAV)	500 mL	500 mL Plastic	None	None

**Footnote:**

<sup>(1)</sup> See the Analytical SOP Reference (Worksheet #23).

**QAPP Worksheet #20**  
**Field Quality Control Sample Summary**

MATRIX	ANALYTICAL GROUP	CONCENTRATION LEVEL	ANALYTICAL AND PREPARATION SOP REFERENCE <sup>(1)</sup>	NUMBER OF SAMPLING LOCATIONS	NUMBER OF FIELD DUPLICATE PAIRS	MATRIX SPIKES	NUMBER OF TRIP BLANKS	NUMBER OF EQUIPMENT BLANKS	TOTAL NUMBER OF SAMPLES TO LABORATORY
Water	PCB	All	W-1, C-13	TBD	1/10	1/20	NA	1/10	TBD
Water	TSS	All	W-2, W-5	TBD	1/10	NA	NA	1/10	TBD
Water	Total phosphorus	All	W-3	TBD	1/10	1/20	NA	1/10	TBD
Water	TAL metals (total)	All	W-14, C-18, C-31, C-33	TBD	1/10	1/20	NA	1/10	TBD
Water	Total cyanide and amenable cyanide	All	W-24, C-19	TBD	1/10	1/20	NA	1/10	TBD
Water	Hardness	All	W-26	TBD	1/10	1/20	NA	1/10	TBD
Water	Low-level mercury (total)	All	C-4	TBD	1/10	1/20	TBD	1/10	TBD
Water	Methyl Mercury	All	C-7	TBD	1/10	1/20	NA	1/10	TBD
Water	SVOCs	All	W-15, C-20	TBD	1/10	1/20	NA	1/10	TBD
Water	VOCs	All	W-21, C-5, C-6	TBD	1/10	1/20	TBD	1/10	TBD
Soil/Sediment	PCB	All	W-4, , C-13	TBD	1/10	1/20	NA	1/10	TBD
Soil	Metals (total/SPLP)	All	W-14, W-25, C-17, C-18, C-31, C-32	TBD	1/10	1/20	NA	1/10	TBD
Soil	Ammonia-N	All	C-9	TBD	1/10	1/20	NA	1/10	TBD
Soil	Nitrate-N	All	C-8	TBD	1/10	1/20	NA	1/10	TBD
Soil	Nitrite-N	All	C-8	TBD	1/10	1/20	NA	1/10	TBD
Soil	Phosphorous	All	C-10	TBD	1/10	1/20	NA	1/10	TBD
Soil	SVOCs	All	W-15, C-20	TBD	1/10	1/20	NA	1/10	TBD
Soil	VOCs	All	W-21, C-5, C-6	TBD	1/10	1/20	TBD	1/10	TBD

**QAPP Worksheet #20  
Field Quality Control Sample Summary**

MATRIX	ANALYTICAL GROUP	CONCENTRATION LEVEL	ANALYTICAL AND PREPARATION SOP REFERENCE <sup>(1)</sup>	NUMBER OF SAMPLING LOCATIONS	NUMBER OF FIELD DUPLICATE PAIRS	MATRIX SPIKES	NUMBER OF TRIP BLANKS	NUMBER OF EQUIPMENT BLANKS	TOTAL NUMBER OF SAMPLES TO LABORATORY
Soil	GRO, DRO	All	W-22, W-23, C-22, C-23	TBD	1/10	NA	TBD	1/10	TBD
Free product	PCBs	All	C-13	TBD	1/10	1/20	NA	1/10	TBD
Free Product	Specific Gravity	Not Applicable	C-16	TBD	NA	NA	NA	NA	NA

**Footnote:**

<sup>(1)</sup> See Analytical SOP Reference (Worksheet #23).

**Note:**

NA = not applicable.

TBD = to be determined

**QAPP Worksheet #23  
Analytical SOP References**

REFERENCE NUMBER	TITLE, REVISION DATE, AND/OR NUMBER	DEFINITIVE OR SCREENING DATA	ANALYTICAL GROUP	INSTRUMENT	ORGANIZATION PERFORMING ANALYSIS	MODIFIED FOR PROJECT WORK? (Y/N)	ADDITIONAL EPA COMMENTS (BEYOND EXPIRATION DATE)?
W-1	Organochlorine and PCB (aroclor) pesticide analysis by GC/ECD, AM E-608, September 11, 2007	Definitive	Total PCB in water	Gas chromatography/ Electron capture detectors (GC/ECD)	Weyerhaeuser Analysis and Testing Services (WATS)	N	No – Approved by EPA with last version of Multi-Area QAPP
W-2	Suspended solids in water and wastewater. AM E-160.2, July 13, 2007	Definitive	TSS	Balance	WATS	N	No – Approved by EPA with last version of Multi-Area QAPP
W-3	Total and total soluble phosphorus in water, AM E-365.3, August 19, 2008	Definitive	Total phosphorus as P in water	Spectrophotometer	WATS	N	No – Approved by EPA with last version of Multi-Area QAPP
W-4	Polychlorinated biphenyl analysis by GC/ECD, AM E-8082, December 4, 2007	Definitive	Total PCB in soil and sediment	GC/ECD	WATS	N	No – Approved by EPA with last version of Multi-Area QAPP
W-5	Daily balance, water, and temperature checks, AQ-O-DLYCHK, February 21, 2007	Definitive	TSS	Balance	WATS	N	No – Approved by EPA with last version of Multi-Area QAPP
W-6	General Procedures for Performing Chromatographic Separations and Calibrations, AL G-8000, September 11, 2007	Definitive	General Procedures	Not Applicable	WATS	N	No – Approved by EPA with last version of Multi-Area QAPP
W-7	Sample Management Procedures, OP S-SMO, July 13, 2007	Definitive	Sample Management	Not Applicable	WATS	N	No – Approved by EPA with last version of Multi-Area QAPP
W-8	Procedure for Training Personnel to Perform Test Methods and Standard Operating Procedures. OQ TRAIN. August 19, 2008.	Not applicable	Training	Not Applicable	WATS	N	No – Approved by EPA with last version of Multi-Area QAPP
W-9	Analytical Procedure 3500, AC G-3500, August 15, 2008	Definitive	PCBs and SVOCs in water	Not Applicable	WATS	N	Yes – But revised by WATS 7/07, per comment 10.6 in 6/07 EPA Letter

**QAPP Worksheet #23  
Analytical SOP References**

REFERENCE NUMBER	TITLE, REVISION DATE, AND/OR NUMBER	DEFINITIVE OR SCREENING DATA	ANALYTICAL GROUP	INSTRUMENT	ORGANIZATION PERFORMING ANALYSIS	MODIFIED FOR PROJECT WORK? (Y/N)	ADDITIONAL EPA COMMENTS (BEYOND EXPIRATION DATE)?
W-10	Extraction by Continuous Liquid-Liquid Extractor, AC G-3520, August 19, 2008	Definitive	VOCs, SVOCs, and PCBs in water <sup>(1)</sup>	Not Applicable	WATS	N	Yes – See Footnote (1) per Comment 10.8 in 6/07 EPA Letter.
W-11	Sonication for Soil and Sediments, AC G-3550, July 13, 2007	Definitive	PCBs and SVOCs in soil and sediment <sup>(2)</sup>	Not Applicable	WATS	N	Yes – See Footnote (2) per comment 10.7 in 6/07 EPA Letter
W-12	Acid Digestion of Aqueous Samples & Extracts for Metals Analysis by ICP & ICPMS, AM E-3010, March 6, 2007	Definitive	Metals in water	Not Applicable	WATS	N	No – Comment 12 in 6/07 EPA letter was suggestion only
W-13	Acid Digestion of Sediments, Soils, Sludges, and Other Solid Samples for Analysis by ICP & ICPMS, AM E-3050, March 6, 2007	Definitive	Metals in soil	Not Applicable	WATS	N	No - Comment 13 in 6/07 EPA letter was suggestion only
W-14	Metals Analysis by ICPMS. AM E-200.8M. August 15, 2008	Definitive	Metals in water and soil	Inductively Coupled Plasma Mass Spectrometer (ICPMS)	WATS	N	Yes – Replaced per Comment 16 in 6/07 EPA Letter
W-15	Capillary GC/MS for Semivolatile Organics. AM E-8270. July 20, 2007	Definitive	SVOCs in water and soil	GC/MS, capillary column	WATS	N	Yes – But revised by WATS 6/07, per comment 10.10 in 6/07 EPA Letter. Revised by WATS 6/09
W-16	Total Solids in Solid and Semi-Solid Samples. AM S-2540G. August 19, 2008.	Definitive	Total solids in soil and sediment	Scale	WATS	N	Added per U.S. EPA 6/07 Comments
W-17	Procedure for Florisil Clean Up of Organic Extracts. AC G-3620. September 11, 2007.	Definitive	PCBs in water, soil, and sediment	Not applicable	WATS	N	Added per U.S. EPA 6/07 Comments

**QAPP Worksheet #23**  
**Analytical SOP References**

REFERENCE NUMBER	TITLE, REVISION DATE, AND/OR NUMBER	DEFINITIVE OR SCREENING DATA	ANALYTICAL GROUP	INSTRUMENT	ORGANIZATION PERFORMING ANALYSIS	MODIFIED FOR PROJECT WORK? (Y/N)	ADDITIONAL EPA COMMENTS (BEYOND EXPIRATION DATE)?
W-18	Gel Permeation Clean-Up. AP E-3640. August 19, 2008.	Definitive	PCBs and SVOCs in water, soil, and sediment	Not applicable	WATS	N	Added per U.S. EPA 6/07 Comments
W-19	Condensation and Evaporation Techniques. AC G-CONC. August 19, 2008.	Definitive	PCBs and SVOCs in water, soil, and sediment	Not applicable	WATS	N	Added per U.S. EPA 6/07 Comments
W-20	Organic Laboratory Analytical Standards. AC G-ORGSTD. July 18, 2007.	Definitive	VOCs, SVOCs, and PCBs in water, soil, and sediment	Not applicable	WATS	N	Added per U.S. EPA 6/07 Comments
W-21	Volatile Organic Compounds by Gas Chromatography/Mass Spectrometry, AM E-8260. August 27, 2008.	Definitive	VOCs in water	GC/MS	WATS	N	--
W-22	Diesel and Motor Oil Range Compounds, Analysis of. AM U-WTPH-D. August 20, 2008.	Definitive	Diesel range compounds	GC/FID, Capillary column	WATS	N	--
W-23	Gasoline Range Compounds, Analysis of. AM U-WTPH-G. August 19, 2008.	Definitive	Gasoline range compounds	GC/FID, megabore column	WATS	N	--
W-24	Cyanide, Total, AM E-335.2 CLP-M. August 27, 2008	Definitive	Cyanide	Spectrophotometer	WATS	N	--
W-25	Synthetic Precipitation Leaching Procedure (SPLP) AM E-1312, March 31, 2003	Definitive	Metals in soil	Not applicable	WATS	N	--
-26	Hardness by Calculation, AM S-2340B, June 12, 2007	Definitive	Hardness in water	Not applicable	WATS	N	--
C-1	Sample Disposal, SMO-SDIS, Rev 7, March 26, 2008	Not Applicable	Sample Disposal	Not Applicable	Columbia Analytical Services (CAS)	N	--

**QAPP Worksheet #23**  
**Analytical SOP References**

REFERENCE NUMBER	TITLE, REVISION DATE, AND/OR NUMBER	DEFINITIVE OR SCREENING DATA	ANALYTICAL GROUP	INSTRUMENT	ORGANIZATION PERFORMING ANALYSIS	MODIFIED FOR PROJECT WORK? (Y/N)	ADDITIONAL EPA COMMENTS (BEYOND EXPIRATION DATE)?
C-2	Sample Tracking and Internal Chain-of-Custody, SMO-SCOC, Rev 12, April 23, 2009	Not Applicable	Chain-of-Custody	Not Applicable	CAS	N	--
C-3	Sample Receiving, SMO-GEN, Rev 25, April 9, 2009	Not Applicable	Sample Receiving	Not Applicable	CAS	N	--
C-4	Mercury in Water by Atomic Fluorescence Spectrometry, MET-1631, Rev 9. March 21, 2008	Definitive	Low-flow mercury in water	Cold-Vapor Atomic Fluorescence Spectrometer (CVAFS)	CAS	N	--
C-5	Volatile Organic Compounds by GC/MS (VOC-8260) Rev 14, November 20, 2009	Definitive	VOCs in soil or water	GC/MS, Capillary column	CAS	N	--
C-6	Purge and Trap/extraction for volatile organics in soil and waste samples, closed system. VOC-5035, REV 7. February 1, 2008.	Definitive	VOCs in soil and waste	Not applicable	CAS	N	--
C-7	Methyl Mercury in Water by Distillation, Aqueous Ethylation, Purge and Trap, and CVAFS Rev 0, MET-1630W, April 12, 2006	Definitive	Low Level Mercury in Water	Cold-Vapor Atomic Fluorescence Spectrometer (CVAFS)	CAS	N	--
C-8	Nitrate/Nitrite, Nitrite By Flow Injection Analysis, GEN-353.2, Rev 6, January 5, 2006	Definitive	Nitrate/Nitrite in Soil	Flow injection Analyzer	CAS	N	--
C-9	Ammonia By Flow Injection Analysis GEN-350.1, Rev 7, May 1, 2007	Definitive	Ammonia-N in Soil	Flow injection Analyzer	CAS	N	--

**QAPP Worksheet #23  
Analytical SOP References**

REFERENCE NUMBER	TITLE, REVISION DATE, AND/OR NUMBER	DEFINITIVE OR SCREENING DATA	ANALYTICAL GROUP	INSTRUMENT	ORGANIZATION PERFORMING ANALYSIS	MODIFIED FOR PROJECT WORK? (Y/N)	ADDITIONAL EPA COMMENTS (BEYOND EXPIRATION DATE)?
C-10	Phosphorous Determination Using Colorimetric Procedure GEN-365.3, Rev 10, August 28, 2008	Definitive	Phosphorus in Soil	Spectrophotometer	CAS	N	--
C-11	Laboratory Balance Monitoring and Calibration, (ADM-BAL.1) August 7, 2008	Definitive	Various (Weighing samples, standards and reagents)	Balance	CAS	N	--
C-12	Corrective Action (ADM-CA), Rev 5, September 12, 2007	Not Applicable	Corrective Action	Not Applicable	CAS	N	--
C-13	PCBs as Aroclors (SOC-8082AR) Rev 13, June 25, 2009	Definitive	PCBs in soil, water and oil	GC/ECD	CAS	N	--
C-14	Waste Dilution Extraction (EXT- 3580) Rev 2, April 30, 2007	Definitive	PCBs in oil	Not Applicable	CAS	N	--
C-15	Sulfuric Acid Cleanup (EXT-3665) Rev 2, April 30, 2007	Definitive	PCBs in oil	Not Applicable	CAS	N	--
C-16	Specific Gravity (Gen-SPGRAV) Rev 0, June 6, 2006	Definitive	Specific Gravity	Hydrometer	CAS	N	--
C-17	Metals and Semivolatiles SPLP Extraction (EPA Method 1312) (MET-SPLP) Rev 0, January 28, 2010	Definitive	Metals in soil	Not Applicable	CAS	N	--

**QAPP Worksheet #23  
Analytical SOP References**

REFERENCE NUMBER	TITLE, REVISION DATE, AND/OR NUMBER	DEFINITIVE OR SCREENING DATA	ANALYTICAL GROUP	INSTRUMENT	ORGANIZATION PERFORMING ANALYSIS	MODIFIED FOR PROJECT WORK? (Y/N)	ADDITIONAL EPA COMMENTS (BEYOND EXPIRATION DATE)?
C-18	Determination of Metals and Trace Elements by Inductively Coupled-Mass Spectrometry (ICP-MS Method 200.8)	Definitive	Metals in water and soil	ICP-MS	CAS	N	--
C-19	Total Cyanides and Cyanides Amenable to Chlorination (GEN-CN) Rev 15, October 20, 2009	Definitive	Cyanide	Spectrophotometer	CAS	N	--
C-20	Semivolatile Organic Compounds by GC/MS – EPA Method 8270C (SOC-8270C) Rev 12, June 26, 2009	Definitive	SVOCs in water and soil	GC/MS	CAS	N	--
C-21	Continuous Liquid-Liquid Extraction (EXT-3520) Rev 12, November 16, 2009	Definitive	SVOCs, and PCBs in water <sup>(1)</sup>	Not Applicable	CAS	N	--
C-22	Gasoline Range Organics by Gas Chromatography (PET-GRO) Rev 8, July 14, 2008	Definitive	Gasoline range compounds	GC/FID	CAS	N	--
C-23	Analysis of Water Solids and Soluable Waste Samples for Semi-Volatile Fuel Hydrocarbons (PET-SVF) Rev 11, October 10, 2007	Definitive	Diesel range compounds	GC/FID, Capillary column	CAS	N	--
C-24	Automated Soxhlet Extraction (EXT-3541) Rev 6, September 28, 2009	Definitive	SVOCs, and PCBs in soil	Not Applicable	CAS	N	--

**QAPP Worksheet #23  
Analytical SOP References**

REFERENCE NUMBER	TITLE, REVISION DATE, AND/OR NUMBER	DEFINITIVE OR SCREENING DATA	ANALYTICAL GROUP	INSTRUMENT	ORGANIZATION PERFORMING ANALYSIS	MODIFIED FOR PROJECT WORK? (Y/N)	ADDITIONAL EPA COMMENTS (BEYOND EXPIRATION DATE)?
C-25	Ultrasonic Extraction (EXT-3550) Rev 9, April 13, 2006	Definitive	SVOCs, and PCBs in soil	Not Applicable	CAS	N	--
C-26	Florisil Cleanup (EXT-FLOR) Rev 4, November 13, 2009	Definitive	PCBs in water, soil, and sediment	Not applicable	CAS	N	--
C-27	Gel Permeation Chromatography (SOC-3640A) Rev 5, January 15, 2004	Definitive	PCBs and SVOCs in water, soil, and sediment	Not applicable	CAS	N	--
C-28	Total Solids (GEN 160.3) Rev 11, April 10, 2007	Definitive	Total solids in soil and sediment	Scale	CAS	N	--
C-29	Metals Digestion (MET-3050) Rev 10, July 12, 2007	Definitive	Metals in soil	Not Applicable	CAS	N	--
C-30	Metals Digestion (MET-DIG) Rev 10, April, 1, 2009	Definitive	Metals in water	Not Applicable	CAS	N	--
C-31	Determination of Metals and Trace Elements by Inductively Coupled Plasma Atomic Emission Spectrometry (MET-ICP) Rev 21, June 26, 2009	Definitive	Metals in water and soil	ICP	CAS	N	--
C-32	Mercury in Solid or Semisolid Waste (MET-7471AB) Rev 14, July 28, 2009	Definitive	Mercury in soil	Cold Vapor Atomic Absorption	CAS	N	--

**QAPP Worksheet #23  
Analytical SOP References**

REFERENCE NUMBER	TITLE, REVISION DATE, AND/OR NUMBER	DEFINITIVE OR SCREENING DATA	ANALYTICAL GROUP	INSTRUMENT	ORGANIZATION PERFORMING ANALYSIS	MODIFIED FOR PROJECT WORK? (Y/N)	ADDITIONAL EPA COMMENTS (BEYOND EXPIRATION DATE)?
C-33	Mercury in Liquid Waste (MET-7470A) Rev 14, September 16, 2009	Definitive	Mercury in water	Cold Vapor Atomic Absorption	CAS	N	--

Notes:

<sup>(1)</sup> See appropriate analytical method for a discussion of how the extract will be stored if not immediately analyzed.

<sup>(2)</sup> Volumes of surrogates and matrix spiking are logged in the laboratory standard log book

**QAPP Worksheet #24  
Analytical Instrument Calibration**

INSTRUMENT	CALIBRATION PROCEDURE	FREQUENCY OF CALIBRATION	ACCEPTANCE CRITERIA	CORRECTIVE ACTION (CA)	PERSON RESPONSIBLE FOR CA	SOP REFERENCE <sup>(1)</sup>
Cold-Vapor Atomic Fluorescence Spectrometer (CVAFS)	See C-4, C-7, C-32, C-33	At the beginning of each analysis sequence.	See C-4, C-7, C-32, C-33	Correct the problem and repeat the calibration.	Analyst	C-4, C-7, C-32, C-33
ICPMS	See W-14, W-26, C-18	At the beginning of each analysis sequence. CCV analyzed after calibration, after every 10 samples (max) and at end. Initial calibration blank/verification follow first CCV.	See W-14, W-26, C-18	Inspect the instrument, correct problems, repeat calibration.	Analyst	W-14, W-26, C-18
ICP	C-31	At the beginning of each analysis sequence. CCV analyzed after calibration, after every 10 samples (max) and at end. Initial calibration blank/verification follow first CCV.	C-31	Inspect the instrument, correct problems, repeat calibration.	Analyst	C-31

**QAPP Worksheet #24  
Analytical Instrument Calibration**

INSTRUMENT	CALIBRATION PROCEDURE	FREQUENCY OF CALIBRATION	ACCEPTANCE CRITERIA	CORRECTIVE ACTION (CA)	PERSON RESPONSIBLE FOR CA	SOP REFERENCE <sup>(1)</sup>
GC/MS	Tuning. See C-5, C-20, W-15 & W-21	Before 12 hr. sample analysis.	See C-5, C-20, W-15 & W-21	Inspect the instrument, correct problems, re-tune and/or recalibrate	Analyst	See C-5, C-20, W-15 & W-21
	Calibration, See C-5, C-20, W-15 & W-21	Initial calibration at instrument set-up and when calibration verification or tuning fail criteria. Calibration verification before 12 hr. sample analysis	See C-5, C-20, W-15 & W-21	Inspect the instrument, correct problems and recalibrate.	Analyst	See C-5, C-20, W-15 & W-21
GC/FID	See W-22, W-23, C-22, & C-23	Initial calibration at instrument set-up and when calibration verification fails criteria. Check mid-point standards after every 10 samples and at the beginning and end of the analysis.	See W-22, W-23, C-22, & C-23	Inspect system, correct problem, and rerun calibration on affected samples.	Analyst	See W-22, W-23, C-22, & C-23
GC/ECD	See W-1, W-4 & C-13	After initial calibration, a check standard of the match-point Aroclor 1016/1260 mixture is analyzed after every 10 samples and at the end of the sequence.	Initial calibration RSD for 1016/1260 $\leq 20\%$ or linear regression $>0.99$  Continuing calibration standard must not exceed a percent difference of $\pm 15$	Inspect system, correct problem, and rerun calibration on affected samples.	Analyst	See W-1, W-4 & C-13

**QAPP Worksheet #24  
Analytical Instrument Calibration**

INSTRUMENT	CALIBRATION PROCEDURE	FREQUENCY OF CALIBRATION	ACCEPTANCE CRITERIA	CORRECTIVE ACTION (CA)	PERSON RESPONSIBLE FOR CA	SOP REFERENCE <sup>(1)</sup>
Balance	See SOP W-5.& C-16	Daily	NA	Inspect system, correct problem, and rerun calibration on affected samples.	Analyst	W-2, W-5 and C-16
Flow Injection Analyzer	See SOP C-8, C-9	Initial calibration at instrument set-up and when calibration verification fails criteria. Verification checked with blank and three standards at the beginning of the analysis. Analyze continuing calibration standard after every 10 samples and at end of sequence.	See SOP C-8 and C-9	Inspect system, correct problem, and rerun calibration on affected samples.	Analyst	C-8, C-9
Spectrophotometer	Construct two 6-point calibration curves of absorbance versus concentration for low and high levels (one curve for Phosphorus).	Before sample analysis, when check standard is outside Confidence Limits; also, after major instrument maintenance	See SOPs W-3, W-24, C-10, C-19	Fix problem and recalibrate.	Analyst	W-3, W-24, C-10, C-19

**Footnote:**

<sup>(1)</sup>See Analytical SOP References (Worksheet #23).

**QAPP Worksheet #25  
Analytical Instrument and Equipment Maintenance, Testing, and Inspection**

INSTRUMENT/ EQUIPMENT	MAINTENANCE ACTIVITY	TESTING ACTIVITY	INSPECTION ACTIVITY	FREQUENCY	ACCEPTANCE CRITERIA	CORRECTIVE ACTION	RESPONSIBLE PERSON	SOP REFERENCE <sup>(1)</sup>
GC/ECD	<ul style="list-style-type: none"> <li>▪ Change septa weekly, or as needed.</li> <li>▪ Change gas line dryers as needed.</li> <li>▪ Replace injection port liner weekly, or as needed.                             <ul style="list-style-type: none"> <li>▪ Clip column.</li> </ul> </li> <li>▪ Replace GC column as needed.</li> <li>▪ Clean/Replace detector as needed.</li> <li>▪ Provide that gas supply is sufficient and delivery pressure is adequate.</li> </ul>	Conduct leak test.	Check connections and bake out instrument.	W-1, W-4 and C-13	W-1, W-4 and C-13	Inspect system, correct problem, rerun calibration, and reanalyze affected samples.	Analyst	W-1, W-4 and C-13
GC/MS	<ul style="list-style-type: none"> <li>▪ See W-15, W-21, C-5, C-20</li> </ul>		See W-15, W-21, C-5	See W-15, W-21, C-5, C-20	See W-15, W-21, C-5, C-20	Inspect system, correct problem, and rerun calibration on affected samples.	Analyst	See W-15, W-21, C-5, C-20
GC/FID	<ul style="list-style-type: none"> <li>▪ See W-22, W-23, C-22, C-23</li> </ul>		See W-22, W-23	See W-22, W-23, C-22, C-23	See W-22, W-23, C-22, C-23	Inspect system, correct problem, and rerun calibration on affected samples.	Analyst	See W-22, W-23, C-22, C-23
Spectro-photometer	<ul style="list-style-type: none"> <li>▪ Dust lamp and front of front lens.                             <ul style="list-style-type: none"> <li>▪ Clean sample compartment.</li> </ul> </li> <li>▪ Clean windows.</li> <li>▪ Clean cuvettes.</li> </ul>		Check the zero.	Daily	See W-3, W-24, C-10, C-19	Inspect system, correct problem, and rerun calibration on affected samples.	Analyst	See W-3, W-24, C-10, C-19
Flow Injection Analyzer	See C-8 and C-9		See C-8 and C-9	See C-8 and C-9	See C-8 and C-9	Inspect system, correct problems, re-run calibration and affected samples if necessary	Analyst	C-8 and C-9
Balance	<ul style="list-style-type: none"> <li>▪ Professional service contract</li> </ul>		NA	Once/year	NA	NA	Service contractor	NA

**QAPP Worksheet #25  
Analytical Instrument and Equipment Maintenance, Testing, and Inspection**

INSTRUMENT/ EQUIPMENT	MAINTENANCE ACTIVITY	TESTING ACTIVITY	INSPECTION ACTIVITY	FREQUENCY	ACCEPTANCE CRITERIA	CORRECTIVE ACTION	RESPONSIBLE PERSON	SOP REFERENCE <sup>(1)</sup>
ICPMS	See ICPMS Instruction Manual		Check gas cylinder pressures, recirculator is 20°C, allow 30-min warm-up after ignition, run performance report, tune instrument.	W-14, W-26, C-18	W-14, W-26, C-18	Inspect system, resolve any deficiencies, rerun calibration on affected samples	Analyst	W-14, W-26, C-18
ICP	See ICP Instruction Manual		Check gas cylinder pressures, recirculator is 20°C, allow 30-min warm-up after ignition, run performance report, tune instrument.	C-31	C-31	Inspect system, resolve any deficiencies, rerun calibration on affected samples	Analyst	C-31
Cold-Vapor Atomic Fluorescence Spectrometer (CVAFS)	See C-4, C-7, C-32, C-33		See C-4, C-7, C-32, C-33	See C-4, C-7, C-32, C-33	See C-4, C-7, C-32, C-33	Inspect system, correct problems, re-run calibration and affected samples if necessary	Analyst	C-4, C-7, C-32, C-33

**Notes:**

<sup>(1)</sup> See Analytical SOP References (Worksheet #23).

**QAPP Worksheet #26  
Sample Handling System (WATS/CAS)**

<b>SAMPLE COLLECTION, PACKAGING, AND SHIPMENT</b>
Sample Collection (personnel/organization): Jennifer Quigley, CRA
Sample Packaging (personnel/organization): Jennifer Quigley, CRA
Coordination of Shipment (personnel/organization): Jennifer Quigley, CRA
Type of Shipment/Carrier: Overnight courier
<b>SAMPLE RECEIPT AND ANALYSIS</b>
Sample Receipt (personnel/organization): Dennis Catalano, WATS (or designee),and/or Jeff Christian (or designee), CAS
Sample Custody and Storage (personnel/organization): Dennis Catalano, WATS (or designee), and/or Jeff Christian (or designee), CAS
Sample Preparation (personnel/organization): Dennis Catalano, WATS (or designee), and/or Jeff Christian (or designee), CAS
Sample Determinative Analysis (personnel/organization): Dennis Catalano, WATS (or designee), and/or Jeff Christian (or designee), CAS
<b>SAMPLE ARCHIVING</b>
Field Sample Storage (number of days from sample collection): 30 days from submittal of final report
Sample Extract/Digestate Storage (number of days from extraction/digestion): 60 days from submittal of final report
Biological Sample Storage (number of days from sample collection): NA
<b>SAMPLE DISPOSAL</b>
Personnel/Organization: Dennis Catalano, WATS, and/or Jeff Christian , CAS
Number of Days from Analysis: 60 days minimum from submittal of final report

**QAPP Worksheet #28-1**  
**QC Samples - PCBs (Surface Water/Groundwater)**

Matrix: Water Sampling SOP: F-11, F-16 Field Sampling Organization: CRA  
 Analytical Group: PCBs Analytical Method/SOP Reference: W-1, C-13 Analytical Organization: WATS, CAS  
 Concentration Level: All Sampler's Name: NA Number of Sample Locations: As identified in appropriate WS 18

QC SAMPLE	FREQUENCY/ NUMBER	METHOD/SOP QC ACCEPTANCE LIMITS	CORRECTIVE ACTION	PERSON(S) RESPONSIBLE FOR CORRECTIVE ACTION	DATA QUALITY INDICATOR (DQI)	MEASUREMENT PERFORMANCE CRITERIA
Field duplicate	1 per 10 samples	RPD <20	Qualify data as needed.	CRA QA Officer	Precision	RPD
Surrogates	2 per sample	Laboratory control limits	Re-extraction/ Reanalysis	Laboratory staff	Accuracy	% Recovery
Method blanks	1 per analytical batch	< Laboratory reporting limit	Re-extraction/ Reanalysis	Laboratory staff	Bias/Contamination	< Laboratory reporting limit
Equipment blanks	1 per 10 samples	< Laboratory reporting limit	Qualify data as needed.	CRA QA Officer	Bias/Contamination	< Laboratory reporting limit
Laboratory control sample (LCS)	1 per analytical batch	Laboratory control limits	Re-extraction/ Reanalysis	Laboratory staff	Accuracy	% Recovery
MS/MSD	1 per 20 samples	Laboratory control limits	Qualify data as needed.	Laboratory staff CRA QA Officer	Accuracy/Precision	% Recovery/RPD

**QAPP Worksheet #28-2  
QC Samples - TSS (Surface Water)**

Matrix: Water Sampling SOP: F-16 Field Sampling Organization: CRA  
 Analytical Group: TSS Analytical Method/SOP Reference: W-2, W5 Analytical Organization: WATS  
 Concentration Level: All Sampler's Name: NA Number of Sample Locations: As identified in appropriate WS 18'

QC SAMPLE	FREQUENCY/ NUMBER	METHOD/SOP QC ACCEPTANCE LIMITS	CORRECTIVE ACTION	PERSON(S) RESPONSIBLE FOR CORRECTIVE ACTION	DATA QUALITY INDICATOR (DQI)	MEASUREMENT PERFORMANCE CRITERIA
Field duplicate	1 per 10 samples	RPD <20	Qualify data as needed.	CRA QA Officer	Precision	RPD
Method blanks	1 per analytical batch	< Laboratory reporting limit	Re-extraction/ Reanalysis	Laboratory staff	Bias/Contamination	< Laboratory reporting limit
Equipment blanks	1 per 10 samples	< Laboratory reporting limit	Qualify data as needed.	CRA QA Officer	Bias/Contamination	< Laboratory reporting limit
Laboratory control sample (LCS)	1 per analytical batch	Laboratory control limits	Re-extraction/ Reanalysis	Laboratory staff	Accuracy	% Recovery

**QAPP Worksheet #28-3  
QC Samples - Phosphorus (Surface Water)**

Matrix: Water Sampling SOP: F-16 Field Sampling Organization: CRA  
 Analytical Group: Total phosphorus Analytical Method/SOP Reference: W-3 Analytical Organization: WATS  
 Concentration Level: All Sampler's Name: NA Number of Sample Locations: As identified in appropriate WS 18

QC SAMPLE	FREQUENCY/ NUMBER	METHOD/SOP QC ACCEPTANCE LIMITS	CORRECTIVE ACTION	PERSON(S) RESPONSIBLE FOR CORRECTIVE ACTION	DATA QUALITY INDICATOR (DQI)	MEASUREMENT PERFORMANCE CRITERIA
Field duplicate	1 per 10 samples	RPD <20	Qualify data as needed.	CRA QA Officer	Precision	RPD
Method blanks	1 per analytical batch	< Laboratory reporting limit	Re-extraction/ Reanalysis	Laboratory staff	Bias/Contamination	< Laboratory reporting limit
Equipment blanks	1 per 10 samples	< Laboratory reporting limit	Qualify data as needed.	CRA QA Officer	Bias/Contamination	< Laboratory reporting limit
Laboratory control sample (LCS)	1 per analytical batch	Laboratory control limits	Re-extraction/ Reanalysis	Laboratory staff	Accuracy	% Recovery
MS/MSD	1 per 20 samples	Laboratory control limits	Qualify data as needed.	Laboratory staff CRA QA Officer	Accuracy/Precision	% Recovery/RPD

**QAPP Worksheet #28-4  
QC Samples - PCBs (Soil/Sediment)**

Matrix: Soil/Sediment Sampling SOP: F-4, F-5, F-6 Field Sampling Organization: CRA  
 Analytical Group: PCBs Analytical Method/SOP Reference: W-4, C-13 Analytical Organization: WATS, CAS  
 Concentration Level: All Sampler's Name: NA Number of Sample Locations: As identified in appropriate WS 18

QC SAMPLE	FREQUENCY/ NUMBER	METHOD/SOP QC ACCEPTANCE LIMITS	CORRECTIVE ACTION	PERSON(S) RESPONSIBLE FOR CORRECTIVE ACTION	DATA QUALITY INDICATOR (DQI)	MEASUREMENT PERFORMANCE CRITERIA
Field duplicate	1 per 10 samples	RPD <50	Qualify data as needed.	CRA QA Officer	Precision	RPD
Surrogates	2 per sample	Laboratory control limits	Re-extraction/ Reanalysis	Laboratory staff	Accuracy	% Recovery
Method blanks	1 per analytical batch	< Laboratory reporting limit	Re-extraction/ Reanalysis	Laboratory staff	Bias/Contamination	< Laboratory reporting limit
Equipment blanks	1 per 10 samples	< Laboratory reporting limit	Qualify data as needed.	CRA QA Officer	Bias/Contamination	< Laboratory reporting limit
Laboratory control sample (LCS)	1 per analytical batch	Laboratory control limits	Re-extraction/ Reanalysis	Laboratory staff	Accuracy	% Recovery
MS/MSD	1 per 20 samples	Laboratory control limits	Qualify data as needed.	Laboratory staff CRA QA Officer	Accuracy/Precision	% Recovery/RPD

**QAPP Worksheet #28-5  
QC Samples - PCBs (Free Product)**

Matrix: Free Product Sampling SOP: F-1, F-3 Field Sampling Organization: CRA  
 Analytical Group: PCBs Analytical Method/SOP Reference: C-13 Analytical Organization: CAS  
 Concentration Level: All Sampler's Name: NA Number of Sample Locations: As identified in appropriate WS 18

QC SAMPLE	FREQUENCY/ NUMBER	METHOD/SOP QC ACCEPTANCE LIMITS	CORRECTIVE ACTION	PERSON(S) RESPONSIBLE FOR CORRECTIVE ACTION	DATA QUALITY INDICATOR (DQI)	MEASUREMENT PERFORMANCE CRITERIA
Field duplicate	1 per 10 samples	RPD <100	Qualify data as needed.	CRA QA Officer	Precision	RPD
Surrogates	1 per sample	Laboratory control limits	Re-extraction/ Reanalysis	Laboratory staff	Accuracy	% Recovery
Method blanks	1 per analytical batch	< Laboratory reporting limit	Re-extraction/ Reanalysis	Laboratory staff	Bias/Contamination	< Laboratory reporting limit
Equipment blanks	1 per 10 samples	< Laboratory reporting limit	Qualify data as needed.	CRA QA Officer	Bias/Contamination	< Laboratory reporting limit
Laboratory control sample (LCS)	1 per analytical batch	Laboratory control limits	Re-extraction/ Reanalysis	Laboratory staff	Accuracy	% Recovery
MS/MSD	1 per 20 samples	Laboratory control limits	Qualify data as needed.	Laboratory staff CRA QA Officer	Accuracy/Precision	% Recovery/RPD

**QAPP Worksheet #28-6  
QC Samples –Metals (Groundwater)**

Matrix: Water Sampling SOP: F-11 Field Sampling Organization: CRA  
 Analytical Group: Metals Analytical Method/SOP Reference: W-14, C-18, C-31, C-33 Analytical Organization: WATS, CAS  
 Concentration Level: All (Except Low-Level Mercury) Sampler's Name: NA Number of Sample Locations: As identified in appropriate WS 18

QC SAMPLE	FREQUENCY/ NUMBER	METHOD/SOP QC ACCEPTANCE LIMITS	CORRECTIVE ACTION	PERSON(S) RESPONSIBLE FOR CORRECTIVE ACTION	DATA QUALITY INDICATOR (DQI)	MEASUREMENT PERFORMANCE CRITERIA
Field duplicate	1 per ten samples	RPD < 100%	Qualify data as needed	CRA QA Officer	Precision	RPD
Method blanks	1 per analytical batch	< Laboratory reporting limit	Re-digestion/ reanalysis	Laboratory staff	Bias/Contamination	< Laboratory reporting limit
Equipment blanks	1 per ten samples	< Laboratory reporting limit	Qualify data as needed	CRA QA Officer	Bias/Contamination	< Laboratory reporting limit
Laboratory control sample (LCS)	1 per analytical batch	Laboratory control limits	Re-digestion/ reanalysis	Laboratory staff	Accuracy	% Recovery
MS/MSD	1 per 20 samples	Laboratory control limits	Qualify data as needed	Laboratory staff CRA QA Officer	Accuracy/Precision	% Recovery/RPD

**QAPP Worksheet #28-7  
QC Samples –Metals (Soil/SPLP)**

Matrix: Soil Sampling SOP: F-5, F-6 Field Sampling Organization: CRA  
 Analytical Group: Metals and SPLP Metals Analytical Method/SOP Reference: W-14, C-18, C-31, C-32 Analytical Organization: WATS, CAS  
 Concentration Level: All Sampler's Name: NA Number of Sample Locations: As identified in appropriate WS 18

QC SAMPLE	FREQUENCY/ NUMBER	METHOD/SOP QC ACCEPTANCE LIMITS	CORRECTIVE ACTION	PERSON(S) RESPONSIBLE FOR CORRECTIVE ACTION	DATA QUALITY INDICATOR (DQI)	MEASUREMENT PERFORMANCE CRITERIA
Field duplicate	1 per ten samples	RPD < 100%	Qualify data as needed	CRA QA Officer	Precision	RPD
Method blanks	1 per analytical batch	< Laboratory reporting limit	Re-digestion/ Reanalysis	Laboratory staff	Bias/Contamination	< Laboratory reporting limit
Equipment blanks	1 per ten samples	< Laboratory reporting limit	Qualify data as needed	CRA QA Officer	Bias/Contamination	< Laboratory reporting limit
Laboratory control sample (LCS)	1 per analytical batch	Laboratory control limits	Re-digestion/ Reanalysis	Laboratory staff	Accuracy	% Recovery
MS/MSD	1 per 20 samples	Laboratory control limits	Qualify data as needed	Laboratory staff CRA QA Officer	Accuracy/Precision	% Recovery/RPD

**QAPP Worksheet #28-8  
QC Samples – Cyanide (Groundwater)**

Matrix: Water Sampling SOP: F-11 Field Sampling Organization: CRA  
 Analytical Group: Cyanide Analytical Method/SOP Reference: W-24, C-19 Analytical Organization: WATS, CAS  
 Concentration Level: Total Sampler's Name: NA Number of Sample Locations: As identified in appropriate WS 18

QC SAMPLE	FREQUENCY/ NUMBER	METHOD/SOP QC ACCEPTANCE LIMITS	CORRECTIVE ACTION	PERSON(S) RESPONSIBLE FOR CORRECTIVE ACTION	DATA QUALITY INDICATOR (DQI)	MEASUREMENT PERFORMANCE CRITERIA
Field duplicate	1 per ten samples	RPD < 100%	Qualify data as needed	CRA QA Officer	Precision	RPD
Method blanks	1 per analytical batch	< Laboratory reporting limit	Re-digestion/ Reanalysis	Laboratory staff	Bias/Contamination	< Laboratory reporting limit
Equipment blanks	1 per ten samples	< Laboratory reporting limit	Qualify data as needed	CRA QA Officer	Bias/Contamination	< Laboratory reporting limit
Laboratory control sample (LCS)	1 per analytical batch	Laboratory control limits	Re-digestion/ Reanalysis	Laboratory staff	Accuracy	% Recovery
MS/MSD	1 per 20 samples	Laboratory control limits	Qualify data as needed	Laboratory staff CRA QA Officer	Accuracy/Precision	% Recovery/RPD

**QAPP Worksheet #28-9  
QC Samples – Cyanide (Soil)**

Matrix: Soil Sampling SOP: F-5, F-6 Field Sampling Organization: CRA  
 Analytical Group: Cyanide Analytical Method/SOP Reference: W-24, C-19 Analytical Organization: WATS, CAS  
 Concentration Level: Total Sampler's Name: NA Number of Sample Locations: As identified in appropriate WS 18

QC SAMPLE	FREQUENCY/ NUMBER	METHOD/SOP QC ACCEPTANCE LIMITS	CORRECTIVE ACTION	PERSON(S) RESPONSIBLE FOR CORRECTIVE ACTION	DATA QUALITY INDICATOR (DQI)	MEASUREMENT PERFORMANCE CRITERIA
Field duplicate	1 per ten samples	RPD < 100%	Qualify data as needed	CRA QA Officer	Precision	RPD
Method blanks	1 per analytical batch	< Laboratory reporting limit	Re-digestion/ Reanalysis	Laboratory staff	Bias/Contamination	< Laboratory reporting limit
Equipment blanks	1 per ten samples	< Laboratory reporting limit	Qualify data as needed	CRA QA Officer	Bias/Contamination	< Laboratory reporting limit
Laboratory control sample (LCS)	1 per analytical batch	Laboratory control limits	Re-digestion/ Reanalysis	Laboratory staff	Accuracy	% Recovery
MS/MSD	1 per 20 samples	Laboratory control limits	Qualify data as needed	Laboratory staff CRA QA Officer	Accuracy/Precision	% Recovery/RPD

**QAPP Worksheet #28-10**  
**QC Samples – Low Level Mercury (Surface Water/Groundwater)**

Matrix: Water Sampling SOP: F-11, F-16 Field Sampling Organization: CRA  
 Analytical Group: Mercury Analytical Method/SOP Reference: C-4 Analytical Organization: CAS  
 Concentration Level: Low-Level Sampler's Name: NA Number of Sample Locations: As identified in appropriate WS 18

QC SAMPLE	FREQUENCY/ NUMBER	METHOD/SOP QC ACCEPTANCE LIMITS	CORRECTIVE ACTION	PERSON(S) RESPONSIBLE FOR CORRECTIVE ACTION	DATA QUALITY INDICATOR (DQI)	MEASUREMENT PERFORMANCE CRITERIA
Field duplicate	1 per ten samples	RPD < 100%	Qualify data as needed	CRA QA Officer	Precision	RPD
Method blanks	1 per analytical batch	< Laboratory reporting limit	Re-digestion/ Reanalysis	Laboratory staff	Bias/Contamination	< Laboratory reporting limit
Trip blanks	1 per cooler	< Laboratory reporting limit	Qualify data as needed	CRA QA Officer	Bias/Contamination	< Laboratory reporting limit
Equipment blanks	1 per ten samples	< Laboratory reporting limit	Qualify data as needed	CRA QA Officer	Bias/Contamination	< Laboratory reporting limit
Laboratory control sample (LCS)	1 per analytical batch	Laboratory control limits	Re-digestion/ Reanalysis	Laboratory staff	Accuracy	% Recovery
MS/MSD	1 per 20 samples	Laboratory control limits	Qualify data as needed	Laboratory staff CRA QA Officer	Accuracy/Precision	% Recovery/RPD

**QAPP Worksheet #28-11  
QC Samples - SVOCs (Groundwater)**

Matrix: Water Sampling SOP: F-11 Field Sampling Organization: CRA  
 Analytical Group: SVOCs Analytical Method/SOP Reference: W-15, C-20 Analytical Organization: WATS, CAS  
 Concentration Level: All Sampler's Name: NA Number of Sample Locations: As identified in appropriate WS 18

QC SAMPLE	FREQUENCY/ NUMBER	METHOD/SOP QC ACCEPTANCE LIMITS	CORRECTIVE ACTION	PERSON(S) RESPONSIBLE FOR CORRECTIVE ACTION	DATA QUALITY INDICATOR (DQI)	MEASUREMENT PERFORMANCE CRITERIA
Field duplicate	1 per ten samples	RPD < 100%	Qualify data as needed	CRA QA Officer	Precision	RPD
Surrogates	6 per sample	Laboratory control limits	Re-extraction/ Re-analysis	Laboratory Staff	Accuracy	% Recovery
Method blanks	1 per analytical batch	< Laboratory reporting limit	Re-extraction/ Reanalysis	Laboratory staff	Bias/Contamination	< Laboratory reporting limit
Equipment blanks	1 per ten samples	< Laboratory reporting limit	Qualify data as needed	CRA QA Officer	Bias/Contamination	< Laboratory reporting limit
Laboratory control sample (LCS)	1 per analytical batch	Laboratory control limits	Re-extraction/ Reanalysis	Laboratory staff	Accuracy	% Recovery
MS/MSD	1 per 20 samples	Laboratory control limits	Qualify data as needed	Laboratory staff CRA QA Officer	Accuracy/Precision	% Recovery/RPD

**QAPP Worksheet #28-12**  
**QC Samples - SVOCs (Soil)**

Matrix: Soil Sampling SOP: F-5, F-6 Field Sampling Organization: CRA  
 Analytical Group: SVOCs Analytical Method/SOP Reference: W-15, C-20 Analytical Organization: WATS, CAS  
 Concentration Level: All Sampler's Name: NA Number of Sample Locations: As identified in appropriate WS 18

QC SAMPLE	FREQUENCY/ NUMBER	METHOD/SOP QC ACCEPTANCE LIMITS	CORRECTIVE ACTION	PERSON(S) RESPONSIBLE FOR CORRECTIVE ACTION	DATA QUALITY INDICATOR (DQI)	MEASUREMENT PERFORMANCE CRITERIA
Field duplicate	1 per ten samples	RPD < 100%	Qualify data as needed	CRA QA Officer	Precision	RPD
Surrogates	6 per sample	Laboratory control limits	Re-extraction/ Re-analysis	Laboratory Staff	Accuracy	% Recovery
Method blanks	1 per analytical batch	< Laboratory reporting limit	Re-extraction/ Reanalysis	Laboratory staff	Bias/Contamination	< Laboratory reporting limit
Equipment blanks	1 per ten samples	< Laboratory reporting limit	Qualify data as needed	CRA QA Officer	Bias/Contamination	< Laboratory reporting limit
Laboratory control sample (LCS)	1 per analytical batch	Laboratory control limits	Re-extraction/ Reanalysis	Laboratory staff	Accuracy	% Recovery
MS/MSD	1 per 20 samples	Laboratory control limits	Qualify data as needed	Laboratory staff CRA QA Officer	Accuracy/Precision	% Recovery/RPD

**QAPP Worksheet #28-13  
QC Samples - VOCs (Groundwater)**

Matrix: Water Sampling SOP: F-11 Field Sampling Organization: CRA  
 Analytical Group: VOCs Analytical Method/SOP Reference: W-21, C-5 Analytical Organization: WATS, CAS  
 Concentration Level: All Sampler's Name: NA Number of Sample Locations: As identified in appropriate WS 18

QC SAMPLE	FREQUENCY/ NUMBER	METHOD/SOP QC ACCEPTANCE LIMITS	CORRECTIVE ACTION	PERSON(S) RESPONSIBLE FOR CORRECTIVE ACTION	DATA QUALITY INDICATOR (DQI)	MEASUREMENT PERFORMANCE CRITERIA
Field duplicate	1 per ten samples	RPD < 100%	Qualify data as needed	CRA QA Officer	Precision	RPD
Surrogates	3 per sample	Laboratory control limits	Re-analysis	Laboratory Staff	Accuracy	% Recovery
Method blanks	1 per analytical batch	< Laboratory reporting limit	Reanalysis	Laboratory staff	Bias/Contamination	< Laboratory reporting limit
Trip blank	1 per cooler	< Laboratory reporting limit	Qualify data as needed	CRA QA Officer	Bias/Contamination	< Laboratory reporting limit
Equipment blanks	1 per ten samples	< Laboratory reporting limit	Qualify data as needed	CRA QA Officer	Bias/Contamination	< Laboratory reporting limit
Laboratory control sample (LCS)	1 per analytical batch	Laboratory control limits	Reanalysis	Laboratory staff	Accuracy	% Recovery
MS/MSD	1 per 20 samples	Laboratory control limits	Qualify data as needed	Laboratory staff CRA Data Validator	Accuracy/Precision	% Recovery/RPD

**QAPP Worksheet #28-14**  
**QC Samples - VOCs (Soil)**

Matrix: Soil Sampling SOP: F-5, F-6 Field Sampling Organization: CRA  
 Analytical Group: VOCs Analytical Method/SOP Reference: C-5 Analytical Organization: CAS  
 Concentration Level: All Sampler's Name: NA Number of Sample Locations: As identified in appropriate WS 18

QC SAMPLE	FREQUENCY/ NUMBER	METHOD/SOP QC ACCEPTANCE LIMITS	CORRECTIVE ACTION	PERSON(S) RESPONSIBLE FOR CORRECTIVE ACTION	DATA QUALITY INDICATOR (DQI)	MEASUREMENT PERFORMANCE CRITERIA
Field duplicate	1 per ten samples	RPD < 100%	Qualify data as needed	CRA QA Officer	Precision	RPD
Surrogates	4 per sample	Laboratory control limits	Re-analysis	Laboratory Staff	Accuracy	% Recovery
Method blanks	1 per analytical batch	< Laboratory reporting limit	Reanalysis	Laboratory staff	Bias/Contamination	< Laboratory reporting limit
Equipment blanks	1 per ten samples	< Laboratory reporting limit	Qualify data as needed	CRA QA Officer	Bias/Contamination	< Laboratory reporting limit
Laboratory control sample (LCS)	1 per analytical batch	Laboratory control limits	Reanalysis	Laboratory staff	Accuracy	% Recovery
MS/MSD	1 per 20 samples	Laboratory control limits	Qualify data as needed	Laboratory staff CRA QA Officer	Accuracy/Precision	% Recovery/RPD

**QAPP Worksheet #28-15  
QC Samples – DRO & GRO (Soil)**

Matrix: Soil Sampling SOP: F-5, F-6 Field Sampling Organization: CRA  
 Analytical Group: DRO & GRO Analytical Method/SOP Reference: W-22& W-23, C-22, C-23 Analytical Organization: WATS, CAS  
 Concentration Level: All Sampler's Name: NA Number of Sample Locations: As identified in appropriate WS 18

QC SAMPLE	FREQUENCY/ NUMBER	METHOD/SOP QC ACCEPTANCE LIMITS	CORRECTIVE ACTION	PERSON(S) RESPONSIBLE FOR CORRECTIVE ACTION	DATA QUALITY INDICATOR (DQI)	MEASUREMENT PERFORMANCE CRITERIA
Field duplicate	1 per ten samples	RPD < 100%	Qualify data as needed	CRA QA Officer	Precision	RPD
Surrogates	1 per sample (DRO) 2 per sample (GRO)	Laboratory control limits	Re-extraction/ Reanalysis	Laboratory Staff	Accuracy	% Recovery
Method blanks	1 per analytical batch	< Laboratory reporting limit	Re-extraction/ Reanalysis	Laboratory staff	Bias/Contamination	< Laboratory reporting limit
Equipment blanks	1 per ten samples	< Laboratory reporting limit	Qualify data as needed	CRA QA Officer	Bias/Contamination	< Laboratory reporting limit
Laboratory Control Sample (LCS)	1 per analytical batch	Laboratory control limits	Reanalysis	Laboratory Staff	Accuracy	% Recovery
MS/MSD	1 per 20 samples	Laboratory control limits	Qualify data as needed	Laboratory staff CRA QA Officer	Accuracy/Precision	% Recovery/RPD

**QAPP Worksheet #28-16  
QC Samples - Hardness (Surface Water)**

Matrix: Water Sampling SOP: F-16 Field Sampling Organization: CRA  
 Analytical Group: Hardness (Calculation) Analytical Method/SOP Reference: W-26 Analytical Organization: WATS  
 Concentration Level: All Sampler's Name: NA Number of Sample Locations: As identified in appropriate WS 18

QC SAMPLE	FREQUENCY/ NUMBER	METHOD/SOP QC ACCEPTANCE LIMITS	CORRECTIVE ACTION	PERSON(S) RESPONSIBLE FOR CORRECTIVE ACTION	DATA QUALITY INDICATOR (DQI)	MEASUREMENT PERFORMANCE CRITERIA
Field duplicate	1 per 10 samples	RPD <50	Qualify data as needed.	CRA QA Officer	Precision	RPD
Method blanks	1 per analytical batch	< Laboratory reporting limit	Re-extraction/ Reanalysis	Laboratory staff	Bias/Contamination	< Laboratory reporting limit
Equipment blanks	1 per 10 samples	< Laboratory reporting limit	Qualify data as needed.	CRA QA Officer	Bias/Contamination	< Laboratory reporting limit
Laboratory control sample (LCS)	1 per analytical batch	Laboratory control limits	Re-extraction/ Reanalysis	Laboratory staff	Accuracy	% Recovery
MS/MSD	1 per 20 samples	Laboratory control limits	Qualify data as needed.	Laboratory staff CRA QA Officer	Accuracy/Precision	% Recovery/RPD

**QAPP Worksheet #28-17**  
**QC Samples – Methyl Mercury (Surface Water/Groundwater)**

Matrix: Water Sampling SOP: F-16, F-11 Field Sampling Organization: CRA

Analytical Group: Methyl Mercury Analytical Method/SOP Reference: C-7 Analytical Organization: CAS

Concentration Level: Low-Level Sampler's Name: NA Number of Sample Locations: As identified in appropriate WS 18

QC SAMPLE	FREQUENCY/ NUMBER	METHOD/SOP QC ACCEPTANCE LIMITS	CORRECTIVE ACTION	PERSON(S) RESPONSIBLE FOR CORRECTIVE ACTION	DATA QUALITY INDICATOR (DQI)	MEASUREMENT PERFORMANCE CRITERIA
Field duplicate	1 per ten samples	RPD < 50%	Qualify data as needed	CRA QA Officer	Precision	RPD
Method blanks	1 per analytical batch	< Laboratory reporting limit	Re-digestion/ Reanalysis	Laboratory staff	Bias/Contamination	< Laboratory reporting limit
Equipment blanks	1 per ten samples	< Laboratory reporting limit	Qualify data as needed	CRA QA Officer	Bias/Contamination	< Laboratory reporting limit
Laboratory control sample (LCS)	1 per analytical batch	Laboratory control limits	Re-digestion/ Reanalysis	Laboratory staff	Accuracy	% Recovery
MS/MSD	1 per 20 samples	Laboratory control limits	Qualify data as needed	Laboratory staff CRA QA Officer	Accuracy/Precision	% Recovery/RPD

**QAPP Worksheet #28-18  
QC Samples - Phosphorus (Soil)**

Matrix: Soil Sampling SOP: F-5, F-6 Field Sampling Organization: CRA

Analytical Group: Total phosphorus (Wet Chemistry) Analytical Method/SOP Reference: C-10 Analytical Organization: CAS

Concentration Level: All Sampler's Name: NA Number of Sample Locations: As identified in appropriate WS 18

QC SAMPLE	FREQUENCY/ NUMBER	METHOD/SOP QC ACCEPTANCE LIMITS	CORRECTIVE ACTION	PERSON(S) RESPONSIBLE FOR CORRECTIVE ACTION	DATA QUALITY INDICATOR (DQI)	MEASUREMENT PERFORMANCE CRITERIA
Field duplicate	1 per 10 samples	RPD <100	Qualify data as needed.	CRA QA Officer	Precision	RPD
Method blanks	1 per analytical batch	< Laboratory reporting limit	Re-extraction/ Reanalysis	Laboratory staff	Bias/Contamination	< Laboratory reporting limit
Equipment blanks	1 per 10 samples	< Laboratory reporting limit	Qualify data as needed.	CRA QA Officer	Bias/Contamination	< Laboratory reporting limit
Laboratory control sample (LCS)	1 per analytical batch	Laboratory control limits	Re-extraction/ Reanalysis	Laboratory staff	Accuracy	% Recovery
MS/MSD	1 per 20 samples	Laboratory control limits	Qualify data as needed.	Laboratory staff CRA QA Officer	Accuracy/Precision	% Recovery/RPD

**QAPP Worksheet #28-19  
QC Samples – Ammonia-N (Soil)**

Matrix: Soil Sampling SOP: F-5, F-6 Field Sampling Organization: CRA

Analytical Group: Ammonia-N (Wet Chemistry) Analytical Method/SOP Reference: C-9 Analytical Organization: CAS

Concentration Level: All Sampler's Name: NA Number of Sample Locations: As identified in appropriate WS 18

QC SAMPLE	FREQUENCY/ NUMBER	METHOD/SOP QC ACCEPTANCE LIMITS	CORRECTIVE ACTION	PERSON(S) RESPONSIBLE FOR CORRECTIVE ACTION	DATA QUALITY INDICATOR (DQI)	MEASUREMENT PERFORMANCE CRITERIA
Field duplicate	1 per 10 samples	RPD <100	Qualify data as needed.	CRA QA Officer	Precision	RPD
Method blanks	1 per analytical batch	< Laboratory reporting limit	Re-extraction/ Reanalysis	Laboratory staff	Bias/Contamination	< Laboratory reporting limit
Equipment blanks	1 per 10 samples	< Laboratory reporting limit	Qualify data as needed.	CRA QA Officer	Bias/Contamination	< Laboratory reporting limit
Laboratory control sample (LCS)	1 per analytical batch	Laboratory control limits	Re-extraction/ Reanalysis	Laboratory staff	Accuracy	% Recovery
MS/MSD	1 per 20 samples	Laboratory control limits	Qualify data as needed.	Laboratory staff CRA QA Officer	Accuracy/Precision	% Recovery/RPD

**QAPP Worksheet #28-20  
QC Samples – Nitrate-N (Soil)**

Matrix: Soil Sampling SOP: F-5, F-6 Field Sampling Organization: CRA

Analytical Group: Nitrate-N (Wet Chemistry) Analytical Method/SOP Reference: C-8 Analytical Organization: WATS

Concentration Level: All Sampler's Name: NA Number of Sample Locations: As identified in appropriate WS 18

QC SAMPLE	FREQUENCY/ NUMBER	METHOD/SOP QC ACCEPTANCE LIMITS	CORRECTIVE ACTION	PERSON(S) RESPONSIBLE FOR CORRECTIVE ACTION	DATA QUALITY INDICATOR (DQI)	MEASUREMENT PERFORMANCE CRITERIA
Field duplicate	1 per 10 samples	RPD <100	Qualify data as needed.	CRA QA Officer	Precision	RPD
Method blanks	1 per analytical batch	< Laboratory reporting limit	Re-extraction/ Reanalysis	Laboratory staff	Bias/Contamination	< Laboratory reporting limit
Equipment blanks	1 per 10 samples	< Laboratory reporting limit	Qualify data as needed.	CRA QA Officer	Bias/Contamination	< Laboratory reporting limit
Laboratory control sample (LCS)	1 per analytical batch	Laboratory control limits	Re-extraction/ Reanalysis	Laboratory staff	Accuracy	% Recovery
MS/MSD	1 per 20 samples	Laboratory control limits	Qualify data as needed.	Laboratory staff CRA QA Officer	Accuracy/Precision	% Recovery/RPD

**QAPP Worksheet #28-21  
QC Samples – Nitrite-N (Soil)**

Matrix: Soil Sampling SOP: F-5, F-6 Field Sampling Organization: CRA  
 Analytical Group: Nitrite-N (Wet Chemistry) Analytical Method/SOP Reference: C-8 Analytical Organization: WATS  
 Concentration Level: All Sampler's Name: NA Number of Sample Locations: As identified in appropriate WS 18

QC SAMPLE	FREQUENCY/ NUMBER	METHOD/SOP QC ACCEPTANCE LIMITS	CORRECTIVE ACTION	PERSON(S) RESPONSIBLE FOR CORRECTIVE ACTION	DATA QUALITY INDICATOR (DQI)	MEASUREMENT PERFORMANCE CRITERIA
Field duplicate	1 per 10 samples	RPD <100	Qualify data as needed.	CRA QA Officer	Precision	RPD
Method blanks	1 per analytical batch	< Laboratory reporting limit	Re-extraction/ Reanalysis	Laboratory staff	Bias/Contamination	< Laboratory reporting limit
Equipment blanks	1 per 10 samples	< Laboratory reporting limit	Qualify data as needed.	CRA QA Officer	Bias/Contamination	< Laboratory reporting limit
Laboratory control sample (LCS)	1 per analytical batch	Laboratory control limits	Re-extraction/ Reanalysis	Laboratory staff	Accuracy	% Recovery
MS/MSD	1 per 20 samples	Laboratory control limits	Qualify data as needed.	Laboratory staff CRA QA Officer	Accuracy/Precision	% Recovery/RPD

**QAPP Worksheet #30-1  
Analytical Services-WATS**

MATRIX	ANALYTICAL GROUP	CONCENTRATION LEVEL	SAMPLE LOCATIONS/ ID NUMBERS	ANALYTICAL SOP	DATA PACKAGE TURNAROUND TIME	LABORATORY/ ORGANIZATION (name, address, contact person, and telephone number)	BACKUP LABORATORY/ ORGANIZATION (name, address, contact person, and telephone number)
Groundwater Surface water, SPLP Leachate	PCBs, TSS, Phosphorus, Metals/SPLP metals, Total Cyanide, SVOCs, VOCs, Hardness	All	TBD	W-1, W-2, W-5 W-3, W-14, W-24 W-15 W-21, W-26	Standard turnaround time (21 calendar days)	Weyerhaeuser Analysis and Testing Services (WATS) Weyerhaeuser Company  Mail Stop: WTC2F25 32901 Weyerhaeuser Way Federal Way, WA 98001  Dennis Catalano 253.924.6242	TestAmerica, Laboratories, Inc. 4101 Shuffel Street NW North Canton, OH 44720  Denise Heckler (800) 456-9396
Soil/ Sediment	PCBs, Metals, SVOCs, DRO/GRO, Cyanide	All	TBD	W-4, W-14, W-15, W-22/W-23 W-25	Standard turnaround time (21 calendar days)	Weyerhaeuser Analysis and Testing Services (WATS) Weyerhaeuser Company Mail Stop: WTC2F25 32901 Weyerhaeuser Way Federal Way, WA 9800  Dennis Catalano 253.924.6242	TestAmerica, Laboratories, Inc. 4101 Shuffel Street NW North Canton, OH 44720  Denise Heckler (800) 456-9396

**QAPP Worksheet #30-2  
Analytical Services-CAS**

MATRIX	ANALYTICAL GROUP	CONCENTRATION LEVEL	SAMPLE LOCATIONS/ ID NUMBERS	ANALYTICAL SOP	DATA PACKAGE TURNAROUND TIME	LABORATORY/ ORGANIZATION (name, address, contact person, and telephone number)	BACKUP LABORATORY/ ORGANIZATION (name, address, contact person, and telephone number)
Groundwater Surface water, SPLP Leachate	PCBs, Metals/SPLP metals, Total Cyanide, SVOCs, VOCs,	All	TBD	C-13 C-18 C-31 C-33 C-19 C-20 C-5	Standard turnaround time (21 calendar days)	Columbia Analytical Services (CAS), Inc 1317 South 13 <sup>th</sup> Avenue Kelso, WA 98626  Jeff Christian 360.557.7222	TestAmerica, Laboratories, Inc. 4101 Shuffel Street NW North Canton, OH 44720  Denise Heckler (800) 456-9396
Surface water	Mercury (low level) Methyl Mercury	All	TBD	C-4 C-7	Standard turnaround time (21 calendar days)	Columbia Analytical Services (CAS), Inc 1317 South 13 <sup>th</sup> Avenue Kelso, WA 98626  Jeff Christian 360.557.7222	TestAmerica, Laboratories, Inc. 4101 Shuffel Street NW North Canton, OH 44720  Denise Heckler (800) 456-9396
Free Product	PCBs , Specific Gravity	All	TBD	C-13, C-16	Standard turnaround time (2 calendar days)	Columbia Analytical Services (CAS), Inc 1317 South 13 <sup>th</sup> Avenue Kelso, WA 98626  Jeff Christian 360.557.7222	TestAmerica, Laboratories, Inc. 4101 Shuffel Street NW North Canton, OH 44720  Denise Heckler (800) 456-9396

**QAPP Worksheet #30-2  
Analytical Services-CAS**

MATRIX	ANALYTICAL GROUP	CONCENTRATION LEVEL	SAMPLE LOCATIONS/ ID NUMBERS	ANALYTICAL SOP	DATA PACKAGE TURNAROUND TIME	LABORATORY/ ORGANIZATION (name, address, contact person, and telephone number)	BACKUP LABORATORY/ ORGANIZATION (name, address, contact person, and telephone number)
Soil/ Sediment	PCBs, Metals, SVOCs, DRO/GRO, Cyanide Phosphorous, Ammonia-N Nitrate-N Nitrite-N	All	TBD	C-13, C-18, C-31 C-32 C-20, C-22/C-23 C-19 C-10 C-9 C-8 C-8	Standard turnaround time (21 calendar days)	Columbia Analytical Services (CAS), Inc 1317 South 13 <sup>th</sup> Avenue Kelso, WA 98626  Jeff Christian 360.557.7222	TestAmerica, Laboratories, Inc.  4101 Shuffel Street NW North Canton, OH 44720  Denise Heckler (800) 456-9396
	VOCs	All	TBD	C-5, C-6	Standard turnaround time (21 calendar days)	Columbia Analytical Services (CAS), Inc 1317 South 13 <sup>th</sup> Avenue Kelso, WA 98626  Jeff Christian 360.557.7222	TestAmerica, Laboratories, Inc.  4101 Shuffel Street NW North Canton, OH 44720 Denise Heckler (800) 456-9396
Independent Data Validation	All	All	--	All	--	Conestoga Rovers & Associates 14496 Sheldon Rd Suite 200 Plymouth, MI 48170 Paul Wiseman 734.453.5123	--

**QAPP Worksheet #30-2  
Analytical Services-CAS**

<b>MATRIX</b>	<b>ANALYTICAL GROUP</b>	<b>CONCENTRATION LEVEL</b>	<b>SAMPLE LOCATIONS/ ID NUMBERS</b>	<b>ANALYTICAL SOP</b>	<b>DATA PACKAGE TURNAROUND TIME</b>	<b>LABORATORY/ ORGANIZATION (name, address, contact person, and telephone number)</b>	<b>BACKUP LABORATORY/ ORGANIZATION (name, address, contact person, and telephone number)</b>
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**Notes:**

NA = not applicable.

TBD = to be determined.

**QAPP Worksheet #31-4  
Planned Project Assessments  
Plainwell Mill Phase II RI Work Plan**

ASSESSMENT TYPE	FREQUENCY	INTERNAL OR EXTERNAL	ORGANIZATION PERFORMING ASSESSMENT	PERSON(S) RESPONSIBLE FOR PERFORMING ASSESSMENT (title and organizational affiliation)	PERSON(S) RESPONSIBLE FOR RESPONDING TO ASSESSMENT FINDINGS (title and organizational affiliation)	PERSON(S) RESPONSIBLE FOR IDENTIFYING AND IMPLEMENTING CORRECTIVE ACTIONS (CA) (title and organizational affiliation)	PERSON(S) RESPONSIBLE FOR MONITORING EFFECTIVENESS OF CA (title and organizational affiliation)
Field performance audit	Periodic, based on field schedule	Internal	CRA	Gregory Carli, CRA (Project Manager)	Jennifer Quigley, CRA (Project Coordinator)	Jodie Dembowske, CRA (Field QA Officer)	Jennifer Quigley, CRA (Project Coordinator)
Field systems audit	Periodic, based on field schedule	Internal	CRA	Paul Wiseman CRA (QA Officer)	Jennifer Quigley, CRA (Project Coordinator)	Jodie Dembowske, CRA (Field QA Officer)	Jennifer Quigley, CRA (Project Coordinator)
Laboratory audit	As needed, based on laboratory performance	Internal	CRA	Paul Wiseman CRA (QA Officer)	Dennis Catalano, WATS (Laboratory Manager)	Dennis Catalano, WATS (Laboratory Manager)	Paul Wiseman CRA (QA Officer)
Laboratory audit	As needed, based on laboratory performance	Internal	CRA	Paul Wiseman CRA (QA Officer)	Jeff Christian CAS (Laboratory Manager)	Jeff Christian CAS (Laboratory Manager)	Paul Wiseman CRA (QA Officer)
Laboratory audit	Per laboratory QA Plan	Internal	WATS	Dennis Catalano, WATS (Laboratory Manager)	Dennis Catalano, WATS (Laboratory Manager)	Dennis Catalano, WATS (Laboratory Manager)	Paul Wiseman CRA (QA Officer)
Laboratory audit	Per laboratory QA Plan	Internal	CAS	Jeff Christian CAS (Laboratory Manager)	Jeff Christian CAS (Laboratory Manager)	Jeff Christian CAS (Laboratory Manager)	Paul Wiseman CRA (QA Officer)

**QAPP Worksheet #31-5  
Planned Project Assessments  
12th Street Landfill RA Work Plan**

ASSESSMENT TYPE	FREQUENCY	INTERNAL OR EXTERNAL	ORGANIZATION PERFORMING ASSESSMENT	PERSON(S) RESPONSIBLE FOR PERFORMING ASSESSMENT (title and organizational affiliation)	PERSON(S) RESPONSIBLE FOR RESPONDING TO ASSESSMENT FINDINGS (title and organizational affiliation)	PERSON(S) RESPONSIBLE FOR IDENTIFYING AND IMPLEMENTING CORRECTIVE ACTIONS (CA) (title and organizational affiliation)	PERSON(S) RESPONSIBLE FOR MONITORING EFFECTIVENESS OF CA (title and organizational affiliation)
Field performance audit	Periodic, based on field schedule	Internal	CRA	Gregory Carli, CRA (Project Manager)	Aaron Stadnyk, CRA (Project Coordinator)	Jodie Dembowske, CRA (Field QA Officer)	Aaron Stadnyk, CRA (Project Coordinator)
Field systems audit	Periodic, based on field schedule	Internal	CRA	Paul Wiseman CRA (QA Officer)	Aaron Stadnyk, CRA (Project Coordinator)	Jodie Dembowske, CRA (Field QA Officer)	Aaron Stadnyk, CRA (Project Coordinator)
Laboratory audit	As needed, based on laboratory performance	Internal	CRA	Paul Wiseman CRA (QA Officer)	Dennis Catalano, WATS (Laboratory Manager)	Dennis Catalano, WATS (Laboratory Manager)	Paul Wiseman CRA (QA Officer)
Laboratory audit	As needed, based on laboratory performance	Internal	CRA	Paul Wiseman CRA (QA Officer)	Jeff Christian, CAS (Laboratory Manager)	Jeff Christian, CAS (Laboratory Manager)	Paul Wiseman CRA (QA Officer)
Laboratory audit	Per laboratory QA Plan	Internal	WATS	Dennis Catalano, WATS (Laboratory Manager)	Dennis Catalano, WATS (Laboratory Manager)	Dennis Catalano, WATS (Laboratory Manager)	Paul Wiseman CRA (QA Officer)
Laboratory audit	Per laboratory QA Plan	Internal	CAS	Jeff Christian, CAS (Laboratory Manager)	Jeff Christian, CAS (Laboratory Manager)	Jeff Christian, CAS (Laboratory Manager)	Paul Wiseman CRA (QA Officer)

**QAPP Worksheet #32-3  
Assessment Findings and Corrective Action Responses  
Plainwell Mill Phase II RI Work Plan**

ASSESSMENT TYPE	NATURE OF DEFICIENCIES DOCUMENTATION	INDIVIDUAL(S) NOTIFIED OF FINDINGS (name, title, organization)	TIME FRAME OF NOTIFICATION	NATURE OF CORRECTIVE ACTION RESPONSE DOCUMENTATION	INDIVIDUAL(S) RECEIVING CORRECTIVE ACTION RESPONSE (name, title, organization)	TIME FRAME FOR RESPONSE
Field performance audit	Checklist	Jennifer Quigley, CRA (Project Coordinator), will notify Gregory Carli, CRA (Project Manager).	Within 72 hours after audit (or sooner, as appropriate)	E-mail response	Jodie Dembowski, CRA (Field QA Officer)	Within 48 hours after notification (or sooner, as appropriate)
Field systems audit	Checklist	Paul Wiseman, CRA (QA Officer), will notify Gregory Carli, CRA (Project Manager).	Within 48 hours after audit (or sooner, as appropriate)	E-mail response	Jodie Dembowski, CRA (Field QA Officer)	Within 48 hours after notification (or sooner, as appropriate)
Internal laboratory audit	Executive Summary from Management Report	Dennis Catalano, WATS (Laboratory Manager), will notify Paul Wiseman, CRA (QA Officer), and appropriate laboratory staff.	Within 48 hours after audit (or sooner, as appropriate)	Executive Summary from Management Report	Paul Wiseman, CRA (QA Officer), and appropriate laboratory staff	Within 48 hours after notification (or sooner, as appropriate)
External laboratory audit	Checklist	Paul Wiseman, CRA (QA Officer), will notify Dennis Catalano, WATS (Laboratory Manager), and Gregory Carli (Project Manager).	Within 1 week after audit	Memorandum	Dennis Catalano, WATS (Laboratory Manager)	Within 48 hours after notification (or sooner, as appropriate)

**QAPP Worksheet #32-3  
Assessment Findings and Corrective Action Responses  
Plainwell Mill Phase II RI Work Plan**

ASSESSMENT TYPE	NATURE OF DEFICIENCIES DOCUMENTATION	INDIVIDUAL(S) NOTIFIED OF FINDINGS (name, title, organization)	TIME FRAME OF NOTIFICATION	NATURE OF CORRECTIVE ACTION RESPONSE DOCUMENTATION	INDIVIDUAL(S) RECEIVING CORRECTIVE ACTION RESPONSE (name, title, organization)	TIME FRAME FOR RESPONSE
Internal laboratory audit	Executive Summary from Management Report	Jeff Christian, CAS (Laboratory Manager), will notify Paul Wiseman, CRA (QA Officer), and appropriate laboratory staff.	Within 48 hours after audit (or sooner, as appropriate)	Executive Summary from Management Report	Paul Wiseman, CRA (QA Officer), and appropriate laboratory staff	Within 48 hours after notification (or sooner, as appropriate)
External laboratory audit	Checklist	Paul Wiseman, CRA (QA Officer), will notify Jeff Christian, CAS (Laboratory Manager), and Gregory Carli (Project Manager).	Within 1 week after audit	Memorandum	Jeff Christian, CAS (Laboratory Manager)	Within 48 hours after notification (or sooner, as appropriate)

**QAPP Worksheet #32-4  
Assessment Findings and Corrective Action Responses  
12th Street Landfill RA Work Plan**

ASSESSMENT TYPE	NATURE OF DEFICIENCIES DOCUMENTATION	INDIVIDUAL(S) NOTIFIED OF FINDINGS (name, title, organization)	TIME FRAME OF NOTIFICATION	NATURE OF CORRECTIVE ACTION RESPONSE DOCUMENTATION	INDIVIDUAL(S) RECEIVING CORRECTIVE ACTION RESPONSE (name, title, organization)	TIME FRAME FOR RESPONSE
Field performance audit	Checklist	Aaron Stadnyk, CRA (Project Coordinator), will notify Gregory Carli, CRA (Project Manager).	Within 72 hours after audit (or sooner, as appropriate)	E-mail response	Jodie Dembowski, CRA (Field QA Officer)	Within 48 hours after notification (or sooner, as appropriate)
Field systems audit	Checklist	Paul Wiseman, CRA (QA Officer), will notify Gregory Carli, CRA (Project Manager).	Within 48 hours after audit (or sooner, as appropriate)	E-mail response	Jodie Dembowski, CRA (Field QA Officer)	Within 48 hours after notification (or sooner, as appropriate)
Internal laboratory audit	Executive Summary from Management Report	Dennis Catalano, WATS (Laboratory Manager), will notify Paul Wiseman, CRA (QA Officer), and appropriate laboratory staff.	Within 48 hours after audit (or sooner, as appropriate)	Executive Summary from Management Report	Paul Wiseman, CRA (QA Officer), and appropriate laboratory staff	Within 48 hours after notification (or sooner, as appropriate)
External laboratory audit	Checklist	Paul Wiseman, CRA (QA Officer), will notify Dennis Catalano, WATS (Laboratory Manager), and Gregory Carli (Project Manager).	Within 1 week after audit	Memorandum	Dennis Catalano, WATS (Laboratory Manager)	Within 48 hours after notification (or sooner, as appropriate)

**QAPP Worksheet #32-4  
Assessment Findings and Corrective Action Responses  
12th Street Landfill RA Work Plan**

ASSESSMENT TYPE	NATURE OF DEFICIENCIES DOCUMENTATION	INDIVIDUAL(S) NOTIFIED OF FINDINGS (name, title, organization)	TIME FRAME OF NOTIFICATION	NATURE OF CORRECTIVE ACTION RESPONSE DOCUMENTATION	INDIVIDUAL(S) RECEIVING CORRECTIVE ACTION RESPONSE (name, title, organization)	TIME FRAME FOR RESPONSE
Internal laboratory audit	Executive Summary from Management Report	Jeff Christian, CAS (Laboratory Manager), will notify Paul Wiseman, CRA (QA Officer), and appropriate laboratory staff.	Within 48 hours after audit (or sooner, as appropriate)	Executive Summary from Management Report	Paul Wiseman, CRA (QA Officer), and appropriate laboratory staff	Within 48 hours after notification (or sooner, as appropriate)
External laboratory audit	Checklist	Paul Wiseman, CRA (QA Officer), will notify Jeff Christian, CAS (Laboratory Manager), and Gregory Carli (Project Manager).	Within 1 week after audit	Memorandum	Jeff Christian, CAS (Laboratory Manager)	Within 48 hours after notification (or sooner, as appropriate)